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Engineering NEWS-RECORD

January 20. 1938

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HOW TO WIN THIS GAME OF *Bridge*

REPUBLIC STEEL

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HIGHEST RUST-RESISTANCE IN ITS PRICE CLASS

Above: On railroad bridges, engineers are defeating corrosion caused by sulphuric acid and other drippings from coal and refrigerator cars by installing corrosion-resisting Toncan Iron plates. . . . In insert: When removal of a section of superstructure on the Brooklyn Bridge necessitated facing, Toncan Iron was selected.

In this "game of bridge," your opponents — corrosion and vibration — are crafty and relentless. Never do they pass an opportunity in their attack. Stakes are high — running into thousands of dollars. To win requires your skill and experience as an engineer — and it requires as a partner a dependable line of construction products.

Alert engineers all over the country are teaming up with Republic steel products — sheets, plates, pipe, tubing, bars, bolts, nuts, rivets, turnbuckles, wire rope clips, nails, wire and other items made of steel, copper-bearing steel and rust-resisting Toncan Iron — and these engineers are winning not only in bridge but in all types of construction. Complete detailed information on Republic steel products will be sent upon request. Write today.

Republic Steel Corporation

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ENGINEERING NEWS-RECORD

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VOL. 120 *JANUARY 20, 1938* No. 3

THIS WEEK AND NEXT

WATER SUPPLY of Eau Claire, Wis., is furnished with few interruptions, thanks to the vigilance of a superintendent who gives careful attention to the distribution system details, river crossing protection and cold weather precautions.

Construction of a new bridge over the Mississippi at Baton Rouge is well under way. Its piers are being sunk by the sand island method on account of the great depth to firm foundation.

The great Central Valley Project, which was described in some detail by News-Record *last summer, is getting under way. A short article in this issue tells what has been done on it up to the present.*

Sacramento's old approach to its I Street bridge with its steep grades and sharp curves became so outmoded that two new ones have been designed and built. Restrictions imposed by existing railroad tracks under the new structure made some rather unique and individual rigid frame bents necessary.

New uses for the Hardy Cross method of moment distribution continue to be suggested. F. Kruys, a Dutch engineer and a member of the American Society of Civil Engineers, presents in this issue a procedure for determining influence line ordinates by a simple modification of familiar procedure.

Rapid erecting of massive halves of timber trusses for San Francisco Exposition Buildings was effected by the use of a derrick lifting a pulley rig, which was attached to the truss at six points.

NEXT WEEK—The Road Show Report Number. Staff reports of equipment displayed at the Road Show in Cleveland and of papers presented at the convention of the American Road Builders Association.

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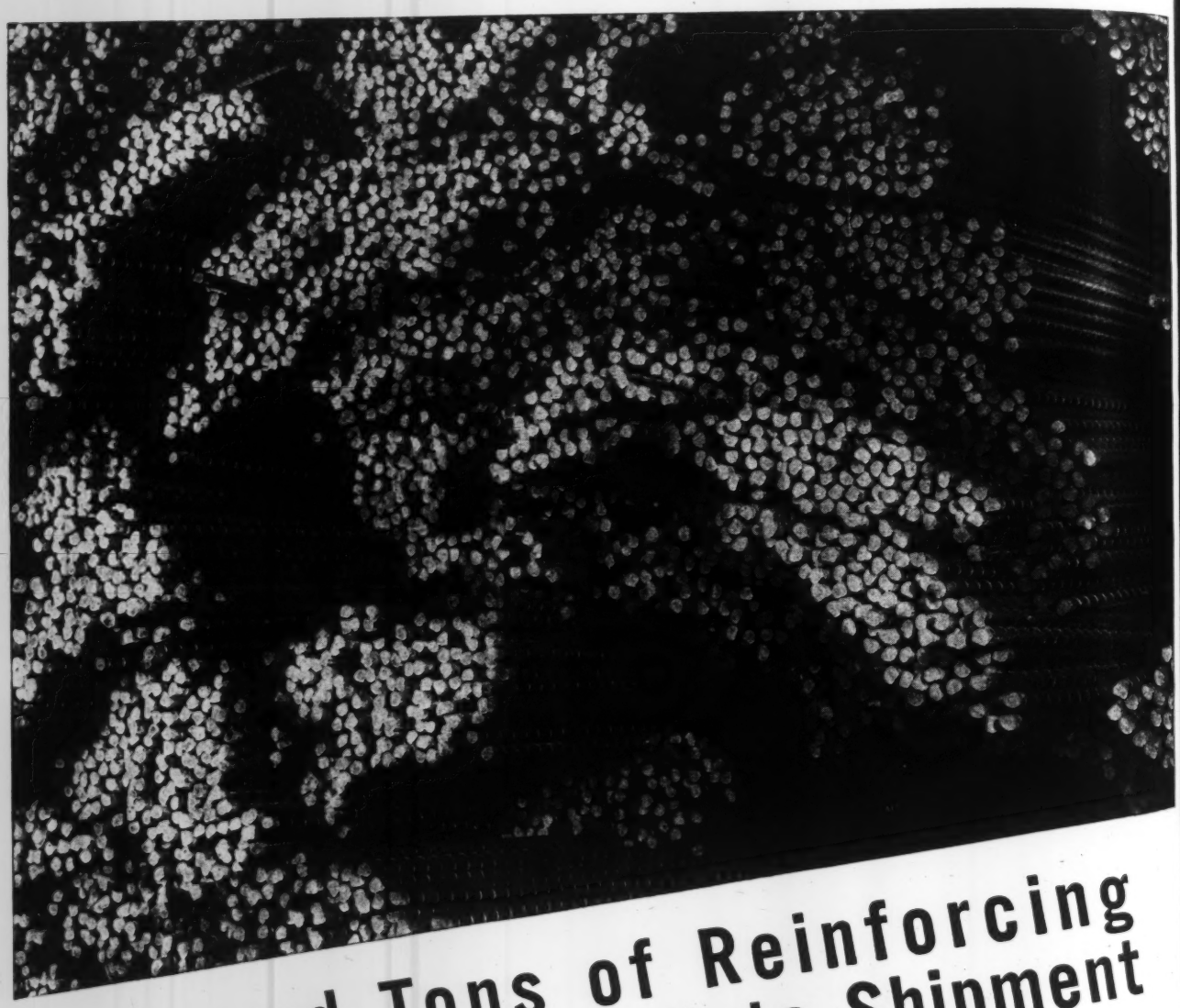
THE COVER PICTURE is of a pier caisson at the Baton Rouge Bridge. Caissons for the bridge pier are being sunk through sand islands by open dredging. In the background, below the falsework, is the circular steel shell of the sand island. Leaning against the shell are the steel forms for the outside of the caisson, stripped and ready to be set for the second lift of concrete. *ENR Staff Photo*

AN INDEX for Vol. 119 is bound at the back of this issue.

Number of copies of this issue printed: 33,010



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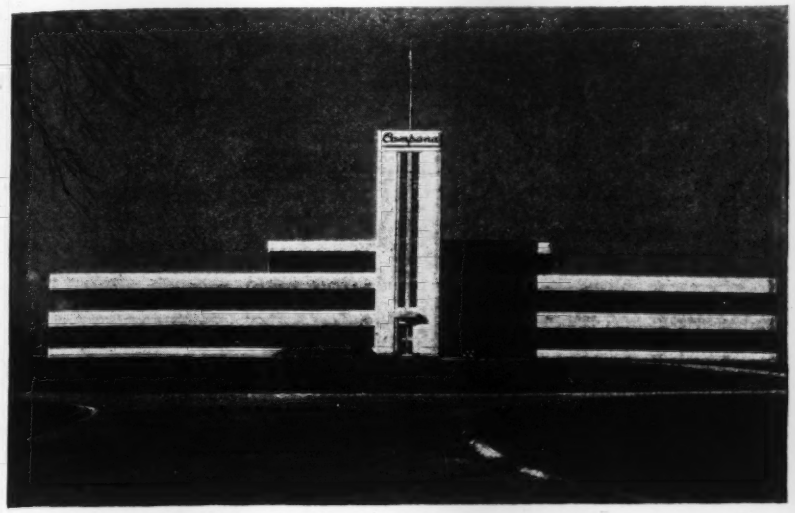
THE WEEK'S EVENTS



GLASS BLOCK FOR A COSMETIC FACTORY

WINDOWLESS, dustproof, air conditioned, the new Batavia, Ill., plant of the Campana Sales Co., is unusual for its wide use of structural glass. Exterior walls are predominantly of glass block and its interior walls and partitions are of Insulux glass block.

The building, with a 325-ft. frontage, provides 85,000 sq.ft. of floor space. It was designed by Frank D. Chase and Childs & Smith of Chicago. Pere Anderson & Co. of Chicago was the general contractor for the Campana Sales Co.

Illinois Builders Exempt From Retailers Tax

Illinois imposes an occupation tax upon retailers, amounting to 3 per cent of their gross receipts from sales. The Illinois Supreme Court held in a recent decision that construction contractors are not in the position of retailers of the materials used in executing their contracts and that they are not subject to the tax.

The Herlihy Mid-Continent Co. and the Underground Construction Co. hold contracts for sewer construction for the sanitary district of Chicago. When the state sought to collect an occupation tax, the contractors appealed to the courts. The lower court held that no tax could be collected on temporary materials which would remain the property of the contractor but upheld the tax on the sand, cement, reinforcing steel and similar materials incorporated in the sewers.

The high court, in its present decision, held that all materials entering the project were "metamorphosed" and lost their identity, and that no tax could be collected. The decision reversed a previous ruling of the same court.

MAJOR NEWS

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Low Unit Cost Found For PWA Houses

Bureau of Labor Statistics finds cost of PWA housing projects less than for private building

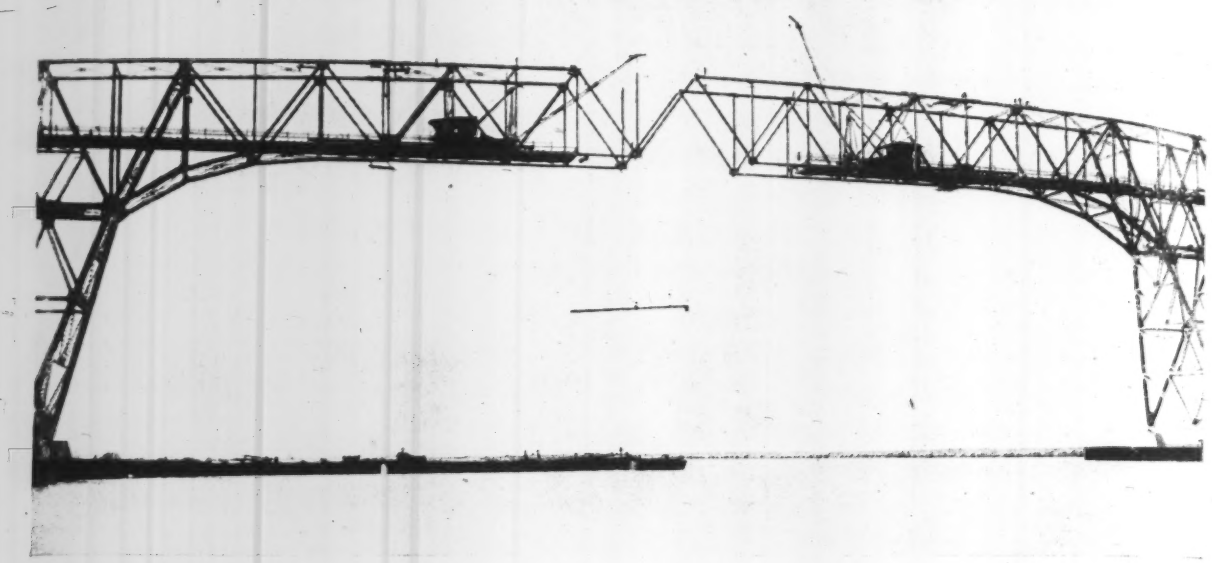
PWA has built low-rent houses at an average cost of $979 per room and $3,549 per dwelling. These results were obtained by the Bureau of Labor Statistics from an investigation of 13 projects, eight in the South and five in the North. The Bureau, which used the same method of analysis as in its regular reports on the cost of building, said that PWA costs were lower in nearly all cases than the cost of comparable private construction.

The average total construction contract cost for the 13 projects was $1,074 per room. This figure, however, included facilities which the Bureau does not ordinarily count as part of dwelling facility costs. These are such items as rentable office buildings and space; store buildings; garages; social and recreational buildings; electrical distribution systems outside of buildings; trunk line sewers and street paving. Social and recreational units contained in space which might have been utilized for dwelling units were included in the Bureau's figures.

The cost figures in the 13 projects studied were as follows:

UNIT COSTS OF PWA HOUSING

Project	Average Cost per Room	Average Cost per Unit
Atlanta, Georgia		
Techwood	$764	$2,688
University Homes	717	2,487
Columbia, S. C.		
University Terrace	1,185	4,031
Dallas, Texas		
Cedar Springs Place	1,219	4,032
Jacksonville, Florida		
Durkeeville	918	3,000
Miami, Florida		
Liberty Square	841	2,977
Montgomery, Alabama		
Paterson Courts	699	2,245
Riverside Heights	905	2,934
Atlantic City, N. J.		
Stanley S. Holmes Village	1,164	3,900
Buffalo, New York		
Kenfield	1,348	5,640
Cleveland, Ohio		
Cedar Central	956	3,380
Outhwaite	1,019	3,811
Milwaukee, Wisconsin		
Parklawn	960	3,739
Average costs for 13 projects	979	3,549
Average costs for eight Southern projects	828	2,847
Average costs for five Northern projects	1,095	4,151



STEEL MEETS STEEL OVER NETCHES RIVER

TRAFFIC will be moving over the Netches River bridge in southeastern Texas before the end of March. Above, the connecting steel is seen being hoisted into place 230 ft. above the river surface from barges below.

The structure involves many interesting departures, including design of the towers to meet the high wind pressure expected in that locality, and unusual construction methods used in the flat swampy area crossed by the approach structures. The $2,750,000 structure, financed by PWA, the state and the county, was begun in 1936.

Little TVA Outlawed In Wisconsin

The Wisconsin Development Authority was held unconstitutional by the Wisconsin Supreme Court on Jan. 11. The Authority was a private non-profit organization empowered to purchase and operate public utility plants. It had received a grant of $130,000 from the state.

The court held that formation of the authority illegally delegated legislative powers to a private organization.

• • •

Voters Approve Lease Of Austin Dam

Austin Dam on the Colorado River of Texas will be leased by the city of Austin to the Colorado River Authority. Voters, at a special election on Jan. 4, approved a lease providing that the authority rehabilitate the dam at an estimated cost of $1,800,000 and operate it for a period of 30 years. The authority will furnish the city $20,000 of free power per year as rental, and at the end of the rental period the city may repurchase the dam at the cost of reconstruction less depreciation.

The original dam on the site failed in 1900 due to faulty foundation conditions. These defects were remedied when the dam was reconstructed in 1911, and it stood until the flood of June, 1935, when a part of the superstructure was washed away. Fears that the foundation might now be unsuitable have been set at rest by borings made by the authority, which indicate that the foundation is safe.

• • •

Pennsylvania Railroad Opens Electrified Line

The Pennsylvania Railroad completed the passenger line phase of its electrification program Jan. 15 when it started electrified passenger train service between Philadelphia and Harrisburg, several months ahead of schedule. Through trains are now running electric and local trains will be under electric power by the end of January.

The program of electrifying the seaboard passenger lines began early in 1929. It embraces all traffic between the New York, Philadelphia, Wilmington, Baltimore, Washington districts and from Philadelphia to the Harrisburg area.

Electrification of the freight lines is not completed as yet, but Pennsylvania expects to complete this by early Spring.

Bids Opened in February On Possum Kingdom

Bids for Possum Kingdom Dam, first and largest of thirteen structures in the $30,000,000 project of the Brazos River Conservation and Reclamation District, will be opened Feb. 24. A WPA allotment of $4,500,000 (*ENR* Dec. 16, 1937, p. 964), recently cleared the way for the start of work and marked the end of a long controversy between the district and the War Department over the cost of the dam. The dam is to be built by the district with its own engineering forces; it has been designed by the Ambursen Engineering Corp. of New York.

The 150-ft. structure will impound 750,000 acre-ft. of water. The present plans do not call for hydroelectric power development, but it is expected that this will be included at a later time.

• • •

County Engineer's Salary

A decision by the Kansas Supreme Court that the state legislature may legally change the salary of a county engineer during his term of office was incorrectly stated in our issue of Dec. 16, 1937, to have been handed down by the Kentucky Supreme Court. The case did not involve Kentucky.

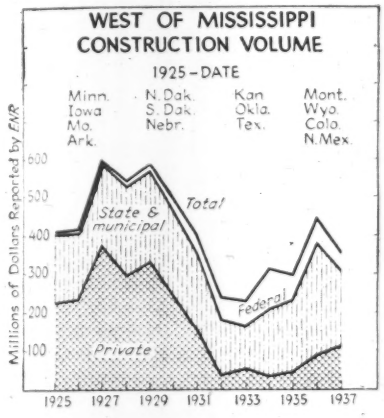
THE CURRENT TREND

This week's news of contract volume and construction cost factors

West of Mississippi Volume Lower

Private construction, highest since 1931, represents 30.2 per cent of regional total

Construction volume in the 14 states making up the West of Mississippi region totals $358,418,000 for 1937, or 15.9 per cent of the U. S. construction total as reported by *Engineering News-Record*. The 1937 total is 20 per cent below the $444,978,000 volume of 1936, but exceeds the annual values



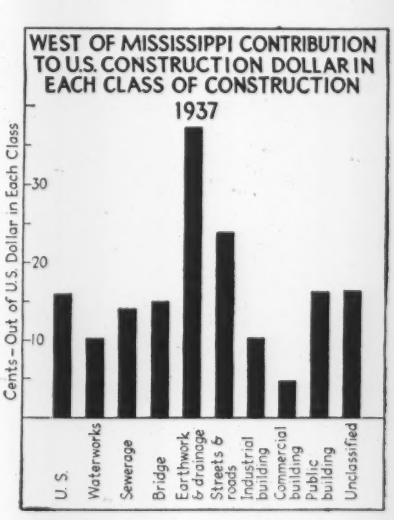
of 1932 through 1935. The record year, 1927, with $593,417,000 is followed by the only two other years that exceed half a billion dollars. The low year since 1925 for this section is 1933 with $225,295,000. The annual average for the 12 years preceding 1937 is $411,280,000.

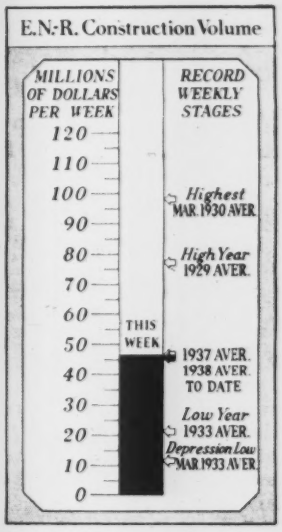
Private construction is the highest since 1931 in the West of the Mississippi states, $107,935,000 in 1937, and 30.2 per cent of the total construction volume reported for the area by *ENR*. The high year for private awards is 1927 with a total of $375,326,000, 63.2 per cent of the total construction volume of the section. The low year for private awards, 1934, produced only 9.7 per cent of the engineering construction total. From 1925 through 1930 private construction ranged from 49.6 to 63.2 per cent of the West of Mississippi total. From 1931 to date private volume ranges from 9.7 to 39.5 per cent of the total.

Federal construction with its peak of $104,492,000 in 1934 when it represented 33.7 per cent of total construction volume, is down to 14.7 per cent of *ENR* reported total for 1937, the lowest since 1931. From 1925 through 1930, federal volume ranged from 1.1 to 10.6 per cent, while from 1931 to date, it has ranged from 14.7 to 33.7 per cent of the total.

West of Mississippi states average an expenditure of 16.4c. of each U. S. construction dollar reported by *ENR* in the 12 years preceding 1937. This drops to 15.9c. in 1937. These states average an expenditure of 17.5c. of each waterworks dollar over the 12 year period; 13.9c. of each sewerage dollar; 20.2c. of each bridge dollar; 21.6c. of each earthwork and drainage dollar; 24.7c. of each street and road dollar; 13.0c. of each industrial building dollar; 8.8c. of each commercial building dollar; 12.8c. of each public building dollar; and 27.7c. of each unclassified dollar. For 1937, expenditures per dollar in each class of construction in the same order are: 10.3c., 13.9c., 14.8c., 37.5c., 23.8c., 10.2c., 4.7c., 16.1c., and 16.3c.

Of the $358,418,000 construction total reported for this section by *ENR* in 1937, waterworks constitute 3.0 per cent; sewerage, 3.7 per cent; bridges, 5.5 per cent; earthwork and drainage, 11.6 per cent; streets and roads, 27.6 per cent; industrial buildings, 13.7 per cent; commercial buildings, 6.0 per cent; public buildings, 14.9 per cent; and unclassified, 14.0 per cent.





THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending Jan. 21 1937	Jan. 13 1938	Jan. 20 1938
Federal	$4,682	$2,478	$2,338
State & Municipal	23,942	24,321	21,149
Total public	$28,624	$26,799	$23,487
Total private	15,317	15,791	24,182
TOTALS	$43,941	$42,590	$47,669

Cumulative		
1938	(3 weeks)	$139,437
1937	(3 weeks)	$128,277

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1937 3 Wk.	1938 3 Wk.
NON-FEDERAL	$23,701	$31,066
State & mun. bonds	25,430 †	25,935
Corporate securities	2,332	1,990
PWA loans, grants	—4,061 †	1,141
RFC loans		2,000
FEDERAL		
TOTAL CAPITAL	$23,701	$31,066

† Represents transfer from federal to private investment financing through sale by RFC of PWA bonds.

ENR INDEX NUMBERS

Index Base	1913	1926
Construction Cost (Jan.)	243.85	117.22
Construction Volume (Dec.)	141	62

CONCRETE PAVEMENT YARDAGE awards in December are 26 per cent below December, 1936, as reported by the Portland Cement Association. Road yardage is 43 per cent lower, while street and alley yardage is 13 per cent higher and 261 per cent higher, respectively, than last December. Reported totals are:

Square Yards Awarded

	December, 1937	12 months, 1937	12 months, 1936
Road	2,303,289	39,670,238	40,623,335
Streets	1,586,000	13,845,273	15,971,676
Alleys	133,412	663,238	381,460
Total	4,022,701	54,178,749	56,986,471

Federal Research Body Asked

Assembly of American Engineering Council discusses federal aid to research activities

Engineering and scientific research is an investment in public welfare since it promotes a higher standard of living and increased employment, the American Engineering Council was told by a committee headed by R. S. McBride. The committee recommended that the federal government encourage research in its own departments, in educational institutions, and in private industry. It was tentatively suggested that a federal research commission be formed, made up of heads of federal agencies engaged in research activities. Such a body could serve governmental and private research activities by acting as a project clearing house to prevent duplication of effort. It might also be used to allot federal financial aid to non-commercial projects proposed by educational institutions and endowed laboratories.

Nearly 100 engineers and educators were present for the assembly, which met in Washington Jan. 13-15. The American Engineering Council represents the engineering profession in matters relating to public policy.

Conservation

Although no formal action was taken, a discussion of the present tendency toward large-scale planning of conservation measures and the development of natural resources leaned strongly toward the opinion that such planning is desirable, but that it should take the form of a coordination of local proposals rather than an assumption of leadership by central agencies.

A resolution favoring the establishment of a department of public works within the national government was adopted. The Council has taken similar action on earlier occasions; its present attitude recognizes the political difficulties involved in complete centralization of public works and therefore favors increased coordination of federal construction agencies as the first step.

Studies of the economic status of the engineer and of engineers' compensation were reviewed and will be continued. The same is true of the merit system in public employment.

Council finances

The meeting discussed the advisability of seeking grants from philanthrophic foundations for carrying out specific projects, but no conclusion was reached. It was recognized that every precaution must be taken to avoid any action that might interfere with or appear to influence the council's freedom of action or that might embarrass the member societies.

Officers elected at the meeting were: President, Dr. William McClellan, representing the A.I.E.E.; vice presidents, Ralph E. Flanders (A.S.M.E.) and A. J. Hammond (A.S.C.E.); treasurer, Leonard J. Fletcher (A.S.A.E.). New members were announced as follows: Vermont Society of Engineers, Maine Association of Engineers, Engineering Society of Detroit, Technical Society of Knoxville, Utah Society of Professional Engineers.

Gilbertsville Dropped By House

Provision for Gilbertsville Dam was dropped from the TVA appropriation when the House on Jan. 11 passed the independent offices appropriation bill. The TVA appropriation was reduced from budget estimates to $37,237,000, leaving $285,000 for further study of the Gilbertsville site. Debate indicated that the dam will not be authorized until dissension among TVA directors is cleared up.

The bill carries $226,331,000 for CCC; $1,500,000 for the Federal Power Commission; $31,652,000 for REA.

The Senate appropriations committee, however, has restored $2,763,000 for the Gilbertsville dam in a version of the bill which it has reported favorably to the Senate. This would bring the TVA sum to $40,000,000.

• • •

Inter-State Crossings Carry Record Traffic

New York-New Jersey vehicle traffic on the bridge and tunnel facilities of the Port of New York Authority reached 22,635,000 during 1937, an increase of 11.3 per cent over 1936 and of 16 per cent over 1935. Traffic of 75,000 cars through the new Lincoln Tunnel in the last days of December apparently was not drawn from the Holland Tunnel or George Washington Bridge, which increased their December traffic 5 and 9 per cent respectively over December, 1936.

Traffic figures are: Holland Tunnel, 13,090,000, up 10.1 per cent; George Washington Bridge, 7,951,000, up 12.7 per cent; Goethals Bridge, 643,000, up 6.3 per cent; Bayonne Bridge, 540,000, up 9.5 per cent; Outerbridge crossing, 336,000, up 11 per cent.

N. J. Water Shortage Is Discussed

New Jersey professional engineers hear solutions to the water problem suggested

Presentation of papers attempting a clarification of New Jersey's water problems and the passage of resolutions, one of which condemns diversion of state highway funds to other purposes, and another of which attacks practices in capital and labor relationships "which are un-American and contrary to law", marked closing sessions of the annual convention of the New Jersey Association of Professional Engineers and Land Surveyors held at Jersey City, January 14-15.

Clyde Potts, consulting engineer, in pointing out that there is but a small margin between available water supplies and present demand in northern metropolitan New Jersey, stated that a further shortage might occur before new supplies can be developed. Previous experience with major water projects in this area indicates that it requires ten to eleven years after its conception for such work to be completed. Difficulties in getting started were said to be legal and financial.

A solution to the problem was suggested by Arnold Frye, of the legal firm of Hawkins, Delafield and Longfellow. He recommended state legislation to form regional water authorities for the northern and southern sections of New Jersey. Work could be financed by issuing bonds of the authorities, payable by contract with municipalities. Such an arrangement would not conflict with existing statutes, he said.

Victor Gelineau, director and chief engineer of the New Jersey State Board of Commerce and Navigation, was elected president for 1938.

• • •

House Design Contest Planned for Fair

It is planned to hold a $250,000 international contest in the design of houses in connection with the 1939 Golden Gate International Exposition at San Francisco. The contest would be sponsored by various groups of material manufacturers, who would hold title to the winning design. Few restrictions other than practicability and livability would be imposed on contestants.

Proposed divisions of the contest are: houses costing less than $5,000; houses unlimited in cost; prefabricated houses. The latter group would be subdivided into competition for steel, precast concrete, wood, other types.

Traffic Scholarships From Sloan Gift

Twelve police officers and eight traffic engineers will be chosen from the cities which are awarded plaques in the National Safety Council's 1937 traffic safety contest and will be given scholarships at Northwestern University Traffic Safety Institute and the Harvard Bureau for Street Traffic Research, respectively. These scholarships have been made possible by a contribution of $25,000 made to the National Safety Council by Alfred P. Sloan, chairman of the board of General Motors Corp.

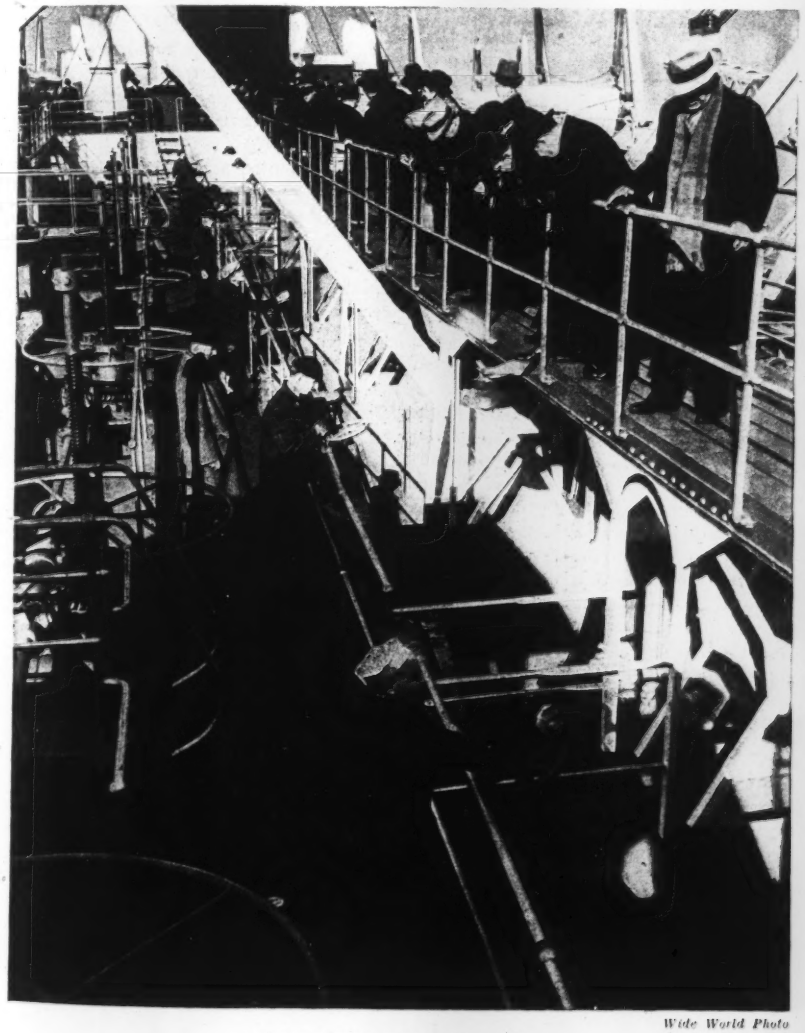
The 1937 National Traffic Safety contest, in which six cities and four states making the best safety records during the year are awarded plaques, closed Dec. 31, and the winners will be announced early in April.

• • •

Trial Agreement Reached On Harrison Sewers

Last fall the city of Harrison, Ark., refused to accept a sewer system built with a PWA loan and grant. As a consequence the sewer district was put into bankruptcy at the request of PWA. (*ENR*, Oct. 7, 1937, p. 583).

Under a tentative agreement now reached, a special Master in Chancery will be appointed who will purchase the existing sewer plants in the city for $7,000. The two systems will then be operated together over a trial period to see if they can meet specifications.



Wide World Photo

BIGGEST DREDGE AT WORK

THE WORLD'S LARGEST hopper dredge, the War Department's new Goethals, made her shakedown run Jan. 6 in New York harbor. She dredged in the Ambrose channel and dumped her load several miles outside Sandy Hook. Workmen above are busy operating valves of the trimming nozzles to equalize the amount of silt entering the tanks and keep the boat even.

Outstanding Road Show In Cleveland

New trends in equipment design revealed at American Road Builders Association Show

The most active convention and brilliant road show in the history of the American Road Builders Association opened in Cleveland Jan. 17. All available exhibition space in the Municipal Auditorium is jammed with the latest offerings of the equipment industry.

The road show

No previous Road Show has presented such a picture of equipment improvement and betterment as is being shown in Cleveland this week.

In opening the convention President Willard Chevalier, vice-president of the McGraw-Hill Publishing Co., made a vigorous statement of the national importance of highway development and emphasized the necessity of carrying forward the construction of a road system capable of serving our rapidly growing traffic. Thomas H. MacDonald, chief of the U. S. Bureau of Public Roads, outlined current trends and requirements in road planning and building. C. H. Purcell, state highway engineer of California and president of the American Association of State Highway Officials, discussed the demands of highway safety. Divisional sessions of the Association and administrative and technical discussions opened on Tuesday, Jan. 18.

Paving mixers are being shown for the first time since 1929. Interest centers around a huge 40 cu.ft. single-drum mixer and three smaller double-drum units. Machinery for building bituminous roads is receiving equal interest, especially the big traveling road mix units, of which there are several on exhibition. Many manufacturers are paying special attention to base stabilization equipment, indicating that this field will be well equipped in the near future.

Grading equipment

Perhaps the greatest advance has been in grading and excavating equipment. Carrying scrapers of all types and sizes are prominent; dump trucks and wagons are bigger and better than ever. The road grader, it is apparent, has evolved into a precision machine designed to meet exacting grading requirements.

Diesel power is found in every type of equipment, even including graders and pumps. Nearly everything is welded; tubular framing and streamlining are producing machines of striking appearance. Better engineering, better

(*Continued on page 96*)

LABOR NOTES

IN AN EFFORT to stimulate building construction, the Cleveland Building and Construction Trades Council has urged affiliated and non-affiliated unions in Cleveland to renew agreements on a two-year basis instead of one year and not to seek increases in wages.

BECAUSE he refused to "cooperate" with an engineer's union in a move to organize state employees and had "failed to attend conferences arranged over the unionization campaign," highway director Murrow of the Washington state highway department has been cited by the executive board of the Seattle Central Labor Council to appear before the Board and explain why the highway department should not be placed on the unfair list.

WPA PROJECTS for clearing land above the Alton Dam in the Mississippi River have been halted on both sides of the river by union objections to the wage scale paid. Common laborers' unions threw picket lines around the jobs in an effort to raise the scale on the Illinois side from 50 cents to the union scale of 90 cents an hour, and on the Missouri side pickets are endeavoring to raise the WPA project scale from 36 cents to 50 cents an hour.

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Silt Transportation Course Offered at Iowa U.

A graduate student course on the transportation of silt and detritus is to be offered in the coming semester by the Department of Mechanics and Hydraulics of the University of Iowa at Iowa City. The course will cover theory, analysis of observations, and sampling methods for studying the movement of suspended solids and bed load by flowing water. Engineering applications to such problems as the erosion of channels and retrogression below dams, filling and flushing of reservoirs, and the control of sediment in branching channels and intakes will be emphasized in the material of the course.

The course is offered jointly by Prof. E. W. Lane, associate director of the Institute of Hydraulic Research, and Prof. F. T. Mavis, head of the department of mechanics and hydraulics.

More Money Assigned For Housing

Housing funds totaling $10,095,000 were earmarked Jan. 12 for eight additional cities by the U. S. Housing Authority. With these earmarkings, funds amounting to $146,645,000 have been set aside for 40 cities out of the $300,000,000 which will be available during the next two years.

The new earmarkings are as follows:

Augusta, Georgia	$1,125,000
Dayton, Ohio	3,000,000
Toledo, Ohio	1,800,000
Allentown, Pennsylvania	1,350,000
McKeesport, Pennsylvania	900,000
Austin, Texas	450,000
Charleston, West Virginia	1,200,000
Morgantown, West Virginia	270,000

New Policy Proposed On Flood Control

President Roosevelt indicated Jan. 18 that the Administration is considering modification of its flood control policy to provide for full federal payment on projects that are able to yield a return in the form of power or of stored water for reclamation. The President pointed out that flood control projects fall in two categories: one for holding back water; the other for protection from water while flowing past.

In regard to the former, the federal government should own the site of the dam and reservoir, so as to have complete title to the stored water. As regards the second, it is only fair that the community which directly benefits should pay part of the cost.

A bill to amend the Omnibus Flood Control Act to conform to the new policy was introduced January 17 by Senator Brown of New Hampshire, and it is understood that a companion measure will shortly be introduced in the House.

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Outstanding Road Show In Cleveland

(*Continued from page 95*)

steel and alloys, and precision parts and accessories are resulting in construction equipment with the operating characteristics and efficiency of machine tools.

An optimistic atmosphere prevails throughout the show: tangible interest is being displayed in all exhibits. The road builders in Cleveland are expecting a busy and prosperous year.

A full account of the features of the convention and show will be published in next week's issue.

Federal Interest Denied In Interstate Compact

The principle that an interstate compact which has been approved by Congress is an act of Congress "affecting the public interest" is attacked in a memorandum submitted to the Supreme Court by the four states of Delaware, Maryland, New Jersey and New York and the Port of New York Authority and the Delaware River Joint Commission.

Colorado-New Mexico pact

The memorandum from these bodies protests against the permission granted Jan. 10 to the U. S. Attorney-General to intervene in a pending case involving the validity of an interstate compact between Colorado and New Mexico. The intervention was permitted under the new law authorizing the federal government to become a party to any suit involving the constitutionality of any action of the federal government. (*ENR*, Jan. 13, 1938, p. 45).

The memorandum attacks the Attorney General's contention that an interstate compact is an act of Congress and said that this theory "will impede, if not defeat the wide use of interstate compacts as a means for solving regional problems clearly beyond the administrative scope of the federal government."

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Memphis Intercepting Sewer Gets Under Way

Construction work began this week on the Front St. sewer in Memphis, Tenn. The 14,000-ft. sewer, practically all of which will be built in tunnel under compressed air 50 to 95 ft. below the surface, is of semi-elliptical section 7 ft. 10 in. high and 7 ft. wide at the spring line. With a capacity of 230 sec.-ft., it will collect sanitary sewage from seven existing outfall sewers now discharging into the Memphis harbor and convey it to a point below the harbor where it will be discharged from the intercepting sewer into the main channel of the Missouri River.

The project is to be finished in April, 1939.

Contract was awarded early this year for section 1 of the sewer to Walsh & Wells, Inc. of St. Louis on a bid of $427,000. Sections 2, 3 and 4 were awarded to the Nolan Construction Co. of Detroit at a total cost of $1,341,000.

Black & Veatch, Kansas City consulting engineers, are the engineers on the project.

Two Dams Approved In New York

Exception made to restrictions on use of federal money for flood control

Flood control dams at Arkport and Whitney Point, N. Y. on the Canisteo and Otselic Rivers, have been approved by the President and work "will proceed without delay". The dams, in the Susquehanna water shed, are part of a project to protect Binghamton, Hornell, Corning and other towns in New York and Pennsylvania. Work on them was started last year with C.C.C. labor.

This is a further exception to the general policy established last November (*ENR*, Nov. 11, 1937, p. 768) halting work on flood control project which will require future appropriations for completion.

Earth-fill dam

The Whitney Point dam will be an earth-filled structure about 1000 ft. long and 92½ ft. high, flanked by wing dikes. It will have a concrete spillway 230 ft. long and with a crest elevation 22½ ft. below the top of the dam. Estimated cost is $1,900,000.

Also an earth-filled structure, the Arkport dam will be 1,205 ft. long and 112 ft. high, with a 150 ft. concrete spillway 16 ft. below the top of the dam. It will cost about $1,413,000.

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Connecticut Court Examines Road Jurisdiction

The Supreme Court of Errors of Connecticut heard arguments Jan. 7 at Hartford Conn., regarding jurisdiction over the letting of contracts for construction and maintenance of Connecticut highways. On a recent claim of the Connecticut Rural Improvement Association, the Superior Court ruled jurisdiction vested in the highway commissioner. Attorney General McLaughlin appealed the ruling, claiming the state Public Work Act of 1937 gave the commissioner of public works this jurisdiction.

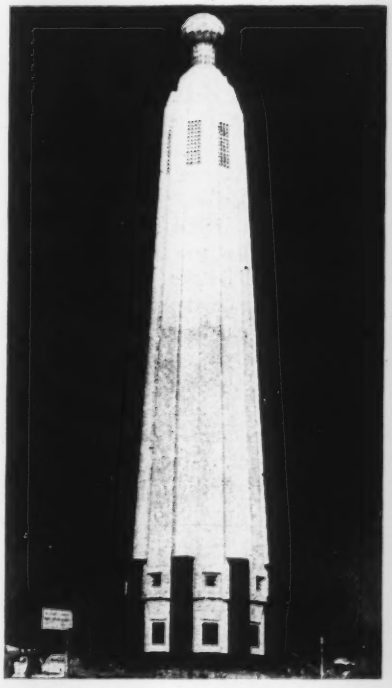
The Attorney General argued that the highways of the state are "real assets" and that the Public Works Act placed real assets under the jurisdiction of the commissioner of public works.

Attorney for the state highway commissioner said:

"By direct and positive legislation, the General Assembly in no way interfered with the administration of two separate and distinct administrative departments, one charged with the supervision of the planning, construction, erection, remodeling, alteration, repair and enlargement of public buildings and their appurtenances under a commissioner of public works. The other is charged with the construction, reconstruction, maintenance and improvement of state highways under a highway commissioner.

Ample funds provided

"Ample funds for the administration of each of these two departments are separately provided for in the act making provision for the expenses of state departments for the two years ending July 1, 1939. Adequate statutory provision for the operation of these two separate departments exists in the statutory law of the State. Each department is enabled to perform the duties assigned to it and efficiently attain the objects sought without any conflict of authority between the two," he concluded.



MEMORIAL TO EDISON

REMOVAL of scaffolding from the Edison Memorial Tower at Menlo Park, N. J., reveals how the 131-ft. shaft will look when it is dedicated Feb. 11. Erected on the site of Edison's original laboratory, the tower commemorates the invention of the electric light. It is surmounted by a huge light bulb 14 ft. high and 2 in. thick molded from 153 sections of pyrex glass. (*ENR*, Nov. 18, 1937, p. 811). Contractors on the structure were Walter Kibbe.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

A RESOLUTION directing the Secretary of War to report on plans for development and cost of a multi-purpose irrigation, navigation, flood control, and power project on the Missouri River at Yankton, S. D. was introduced into Congress Jan. 10 by Representative Harrington of Iowa.

A NEW PUBLIC WORKS PROGRAM by the federal government was advocated by Mayor LaGuardia of New York City as the best method of stimulating the heavy goods industries and relieving unemployment in testimony before the Senate Unemployment and Relief Committee, Jan. 17. Mayors of Detroit, San Francisco and Cleveland likewise urged that the federal government expand the present relief program to care for the increased demand for relief resulting from the business recession.

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F.T.C. Halts Price Fixing In Metal Windows

The Federal Trade Commission has ordered the Metal Window Institute to stop fixing the prices of metal windows by combination and collusive bidding.

Practices from which the Institute is ordered to desist include: establishing and maintaining minimum prices and uniform discounts; coercing competitors into adopting these prices; filing bids to be quoted with a central bureau; securing cancellation of bids where prices quoted are less than those maintained by the Institute.

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Elevated Highway Design Contest for Students

An urban elevated highway, rather than the usual bridge, is the subject this year of the American Institute of Steel Construction's annual design competition for students of engineering and architecture.

Subject of competition is a steel elevated highway carrying express vehicle traffic along a marginal avenue. Highway will carry two pairs of lanes separated by a 2-ft. curb, each pair of lanes 22 ft. between curbs.

Prizes are $150, $100 and $50. Closing date is April 9, 1938.

News continued on page 121

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Contractors' Dust Control Tests

Sir: In your issue of Jan. 6 George S. Kelley, in commenting on the article "New Rock Drill Dust Control" in the Dec. 30 issue, makes the general statement that this article is misleading and does not state the facts. The following reply to his contentions refutes his statement.

He states that few meagre and questionable tests have been conducted. Actually, the contractors have carried out over 200 practical tests, all open to public inspection and conducted openly on a public works project. There has been nothing secretive about the contractors' endeavors, as intimated by Mr. Kelley, and invitation to view the test and development work was continuously extended to everyone interested in the rock dust problem. Among those invited were manufacturers of dust trapping devices, rock drill manufacturers, public health authorities, representatives of mining and insurance companies and editors of the technical press. A representative of the U. S. Bureau of Mines was in constant attendance. Furthermore, there is no doubt that the tests of wet drilling conducted under field conditions have proved more efficacious than those made merely as laboratory tests of dust trapping devices.

Mr. Kelley was invited to demonstrate his dust trapping device on a tunnel project, using six drills on a jumbo, but declined and later conceded his refusal was based on his belief that the exhaust type of control was impractical under usual tunnel operating conditions. At a state department of labor public hearing on Dec. 17, 1937, in commenting on another speaker's contention that tunnels should be drilled wet he stated: "Mr. Commissioner, I would like to speak as a practical rock driller. . . . I do know that with exhaust methods of control dust can be controlled in a tunnel, but I do not think that the speed that is demanded and required by the contractor for him to keep inside of the price at which he does the work can be met with an exhaust method of drilling at this time. I do agree with him heartily that at this time tunnel work should be done wet, but as to other parts of the work, I don't see how wet drilling can be carried out successfully, especially in bench work. That is a case of drilling it dry, but in so far as tunnels are concerned, I might agree with him in his statements."

Statistics show that in South Africa where wet drilling with ventilation prevails there has been no new case of silicosis in the last twenty years. Also, in the Butte and Ontario mining districts and at Cananea, Mexico, where similar methods of drilling are applied, there have been no new cases of silicosis for many years past. These facts refute Mr. Kelley's statement that despite use of wet drilling in foreign and domestic mining centers silicosis still prevails.

I wish to correct Mr. Kelley's contention that in the demonstration of wet drilling on Dec. 7 the drills were operated at very reduced speed and that none of the holes were cleaned before loading, for in reality the actual speed of the drills was far in excess of that required by the state test requirements, most of the time 50 per cent greater with 20 lb. pressure above that required by the state code. Also, his reference to muck clinging to a drill steel is of no clear significance. In cleaning or blowing out holes by the wet method only a wet sludge is ejected, while with dry drilling a cloud of dust is disseminated into the air.

I wish to correct Mr. Kelley's impression that failure of contractors to use certain dust trapping devices, approved under laboratory test only, constitutes a violation of the law. Wet drilling was one of the methods approved by the industrial code governing the New York silicosis act, effective May 1, 1937. Pending approval of specific drills and formation of definite rules of wet drilling procedure, the state authorities recognized wet drilling as a permissible dust control measure, and the contractors' operations have been repeatedly checked to obviate such violations.

The contractors have been most sincere in their endeavors to provide devices and methods not only designed to comply with the law but also to promote the highest standards of industrial hygiene for the protection of the workmen. Their tests on dust trapping devices were sincerely conducted and every effort was made to effect a practical operation. Yet exhaustive tests with such devices on the Sixth Ave. subway project proved them as most impractical under conditions that prevailed—and such conditions are universal on tunnel and deep cut-and-cover construction.

FRED W. STIEFEL
Chief Engineer for The Park Contr. Corp. The Rosoff-Brader Const. Corp.
New York, Jan. 7, 1938

Salvage From Sewage

Sir: The fascinating idea of the recovery of valuable constituents from sewage discussed by Dr. Rudolfs was immortalized by Victor Hugo in *Les Miserables* and has excited people from his day to this. But in spite of innumerable attempts to achieve this objective, relatively little has as yet been accomplished other than utilization of gases from digestion and use of sludge as fertilizer.

There *are* valuable constituents in sewage but like the gold in seawater they are greatly diluted. Consequently, the great obstacle to the economic utilization of sewage lies in the fact that it is mostly water. Until such time as research may demonstrate means whereby the recoverable byproducts in sewage can be obtained at costs less than their value, there is little likelihood of widespread plant-scale recovery except where recovery is necessitated by other than economic factors.

While at present there may appear to be an increasing trend towards recovery of byproducts in sewage treatment, it must be remembered that treatment plants are now many more than a few decades ago and that in proportion to the number of plants there may be no more attention being paid to this problem than at the beginning of the century.

Although it would be unwise to discourage the plant operator in his attempts to recover as much value as feasible from the byproducts of sewage treatment or to stop the labora-

tory worker in his research into this problem, these activities should not be allowed to conflict with the attempts to achieve the goal of all sewage treatment, which is the disposal of objectionable and dangerous wastes in the most economical manner consistent with the requirements of health and comfort.

HARRISON P. EDDY, JR.
Metcalf & Eddy, Boston, Jan. 8, 1938

Sir: The discussion of the question salvage from sewage by Willem Rudolfs, and your editorial comment on this subject are as timely as they are interesting. The possibilities of placing sewage disposal on an economic as well as hygienic and esthetic basis merits not only the careful consideration of the designing engineer but also the appreciation of the tax-paying public of the efforts of research workers in this field.

The difficulties that beset public authorities in constructing much needed sewage disposal improvements are undoubtedly diminished in proportion as the way can be opened up to place sewage disposal on the right side of the economic ledger. The fact that sewage disposal is now on its way to paying its way lends encouragement to believe that we are now entering upon an era of more satisfactory sewage treatment than ever before.

It will be recalled that in times past the treatment of sewage was undertaken primarily in the interests of the public health. Subsequently, and up to the present time, a second and even more cogent reason for the installation of modern sewage treatment works, is the elimination of nuisance. And now we find that the positive economic value of sewage treatment is becoming an important third factor in the argument for modern sewage treatment works.

As both Dr. Rudolfs and your editorial point out, there is much work to be done before sewage and industrial wastes treatment in general can be made economically self-sustaining. From the point of view of engineering design and operation, the ideal of financially profitable sewage disposal may entail complexities of plant layout and the need for such expert supervision as to make the attainment of the desired objective impracticable for some time to come; yet it is true that thousands of small communities are deprived of the modern benefits of sewage treatment because of the factor of high costs alone, and any alleviation of the burden of costs to such communities is basically important. The contributions of research such as those of Dr. Rudolfs' therefore assume distinct social significance.

In relation to the already recognized basic byproducts of power gas, sludge fertilizer and reclaimed water, I believe that, without diminishing our efforts towards the recovery of other and probably hitherto unsuspected sources of income from sewage disposal, our immediate problem and challenge is to make these already proven byproducts more generally available through refinements of design and more positive control of operation. We must strive to do for the small communities requiring sewage disposal what industry has done for the citizen of small income, requiring transportation by automobile, namely to make available to communities of limited taxable assets and financial resources, the benefits now enjoyed chiefly by the larger communities of the world.

HARRY N. JENKS
Consulting Sanitary Engineer
Berkeley, Calif., Jan. 7, 1938

Still Larger Pipe

Sir: In your issue of Nov. 25, 1937, 849, it is stated that the short section of wood stave pipe 19 ft. in diameter used as a blending tank by the International Paper Co. at Palmer, N. Y., is believed to be the largest diameter wood pipe in existence.

We agree that this is a large pipe; however, we have built three pipes 20 ft. inside diameter by 120 ft. long. All three of them are still in service. One of them was built in 1929 for the Olympic Forest Products Co. at Port Angeles, Wash.; and two of them were built in 1931 for the Pulp Division of the Weyerhaeuser Timber Co. at Longview, Washington.

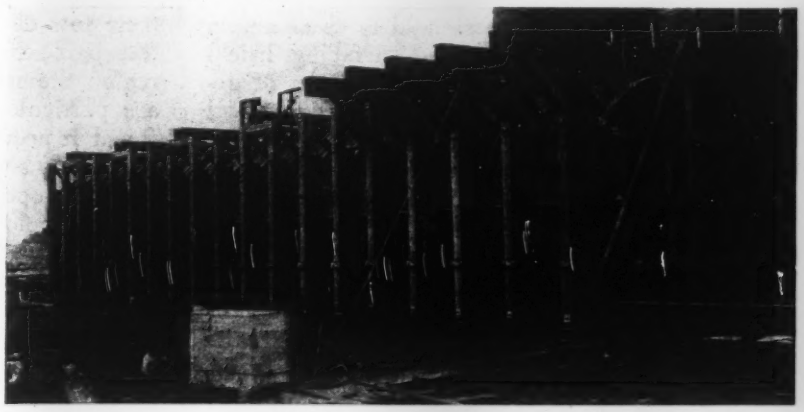
We are enclosing herewith photographs which show in detail how these pipes were constructed.

RAY C. HANSEN
Technical Director,
National Tank & Pipe Co. Portland, Ore.
Dec. 28, 1937

Land Descriptions

Sir: I was amused by the letters in *Engineering News-Record* Dec. 16, 1937, p. 970 land descriptions by C. E. Garnett and H. H. Munger giving unusual land descriptions. I find many such descriptions in my work. Here is one I found awhile ago while searching in the Cumberland County registry of deeds: "Beginning at an apple tree at about a five minutes walk from Trefethens landing thence easterly to an apple tree, thence southerly to a rock, thence westerly to an apple tree thence northerly to the point of beginning." Now as there were about 40 apple trees in that vicinity and the ground full of rocks about the only thing a surveyor could determine would be that a parcel of land was located in an apple orchard. Now our state legislatures have passed a law that all land surveyors must be licensed and such descriptions are allowed to be recorded every day, with the result that there are a great number of lawsuits, and if a surveyor is called on he is given such a description to define the bounds.

E. O. STEPHENSON
Town Engineer, Cape Elizabeth, Maine
Dec. 29, 1937



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Editorial Offices at 330 West 42nd Street, New York

JANUARY 20, 1938

BY REAFFIRMING its advocacy of a federal public-works department last week American Engineering Council laid due emphasis on the fact that efficient conduct of a major operating function requires a good system of organization. Private business has long recognized this fact in respect to its engineering and construction operations. Every large railroad or manufacturing enterprise, however diversified in its activities, places the planning and execution of its physical works in the hands of a single agency, to assure competence and economy. Considerations that lead to this form of organization apply as much to governments, whether city, state or national. Probably few states or cities that have set up central works departments will willingly abandon the system. The greater volume and diversity of national works is, if anything, a further reason for putting a competent, specialized organization in charge. Every passing year makes the argument stronger, and while it appears certain that the reform will in time come about it is well for engineering groups to continue their efforts for a national works department in order that the community may have the benefit of its efficiency.

Brick Passes Hard Test

THE QUALITY of modern paving brick disclosed by the rigid tests of the Port of New York Authority described in this issue is a tribute to manufacturing progressiveness. Already producing a material that many engineers hold to be of ample strength and durability for road surfacing, brickmakers promptly took up the new process of deairing advanced as a promising technological improvement about four years ago. Today leading manufacturers are producing deaired brick as a regular practice. With deairing came an even closer control of materials, drying and burning. The result is the kind of brick used for the Lincoln Tunnel roadway, showing in comparative tests a hardness, toughness and strength close to or greater than the values given by the best granite paving blocks. There can be little question of the reliability of the comparative figures. Possibly because of the predominance of granite block as the favored material for heavy-service paving in New York City the brick for the tunnel paving was subjected to the hardest test ever given to this material. Nothing less than this rigid examination was justified.

Dust Control Progress

REAL PROGRESS in the elimination of the silicosis hazard in rock drilling has been made by the drill manufacturers in cooperation with contractors and New York state officials. Through their trade association and individually the manufacturers have been interested and active in working out wet-drilling procedure to meet the intent and requirements of the state Silicosis Act, as noted elsewhere in this issue. Charges made in these columns two weeks ago that the drill manufacturers were not cooperating in the dust control problem were based on what has since been found to be misleading information which created wrong impressions. As the exhaust system of dust control, which is applicable to many drilling operations, has already been approved, and now that wet drilling is certain to be established soon as a control measure, the silicosis situation in rock driling in New York is well under control. There still remains the problem of adjusting the drilling operations to the rules and regulations set up under the law. But continued cooperation among state authorities, manufacturers and contractors will soon work out any difficulties and make the Silicosis Act the effective health measure it was intended to be.

Trunk Highways

THE GOVERNOR NICE HIGHWAY just opened by Maryland as initial link of a modern trunk road from Baltimore to Philadelphia and as part of the future main coastal highway from north to south is a significant expression of current roadbuilding trends. The limitations that beset the improved wagon trails which serve as trunk lines of our present road system are too confining to allow their full development for dense, rapid and safe transport service. In the populous Middle Atlantic region the restrictions of existing road locations are particularly serious, and just as New Jersey found it necessary to break through new country to open up a route southwestward from the Hudson when the opening of the Holland Tunnel initiated new traffic flow so Maryland sought a new location when it concluded that a more capacious traffic channel in the direction of Wilmington, Philadelphia and New York was needed. Undoubtedly we are at the beginning of an active epoch of trunk-road construction; the state road-planning surveys should soon reveal the need for such trunks in

quantitative terms. In the meantime such links as the Governor Nice road are important full-scale experiments as to structure and details as well as plan. The Baltimore experiment, for example, will furnish valuable evidence on the possibility of protecting an arterial road against roadside encroachment. It should soon show whether freeway construction must be made the rule for such routes.

Red-Ink Reflections

MONEY IS NOT EVERYTHING, and this is true especially in these days of social idealism. Yet money and profits are necessary elements in sound business, even in engineering and construction. Accordingly, when one finds that the construction industry lost money in every one of the eight years from 1929 to 1936 inclusive, as shown by a table in the last Department of Commerce publication on national income, it causes one to think.

During the boom year of 1929 two million dollars were lost; in 1932 the loss reached a top figure of 322 millions, and in 1936 it still stood at 93 millions. The total loss for the eight years was $1,300,000,000. To be sure, the Department of Commerce does not describe these figures as "losses"; it calls them "negative business savings." But after all, when savings are minus they are just plain losses. The figures mean in any event that construction ran behind during eight years to the tune of more than a billion and a quarter dollars, and that even in one of its busiest years it was in red ink.

There is more here than depression results. Nor are the deficits chargeable to some method of tabulation that tends to produce minus figures. The farmer, for instance, is shown in the same table to have had six profitable years to balance his two years of "negative business savings"; he made an aggregate net profit during the eight years of nearly five billion dollars. Yet the farmer is a universal object of sympathy: The public is taught that he is downtrodden, the sob magazines weep over him, and Congress endows him every year with new hundreds of millions of "aid." But the construction industry, the nation's Number One money-loser, is often suspected by citizens and public officials alike of profiteering.

The situation challanges thought. Is construction good business? Does it know how to keep its accounts in order? Is it carried on by sound methods or is it in need of basic reform? These are some of the questions that the red-ink record of eight years brings to the front. Construction ought to do a bit of introspecting to find out what is wrong. Then perhaps it can proceed to a cure.

Valuation Trends

STRAWS INDICATE THE WAY the wind blows. In past weeks members of the U. S. Supreme Court said or did things that indicate the coming of significant changes in the court's views on rate making. To the many engineers interested in valuation work these indicators are significant.

In the first place Justice Sutherland, one of the conservatives of the court has retired. He is to be succeeded by a liberal whose views on property valuation may be expected to be in close harmony with those of the President.

Of more direct bearing on the matter of rate fixing is the court's action in sending the Pacific Gas & Electric rate case back to the district court for a finding as to whether rates set by the California Railroad Commission will result in confiscation. The commission had valued the company's property chiefly on the basis of original cost; the district court, following a long established precedent set by the Supreme Court itself, rejected this finding on the ground that due weight had not been given to the cost of reproduction. In sending the case back the Supreme Court noted that reproduction cost and all other elements that must be considered had been reviewed by the commission. Under these circumstances, said Chief Justice Hughes, the question that remains for this court or the lower court is not the mere correctness of method and reasoning adopted by the regulating agency but the simple question whether the rate it fixed will result in confiscation. Should no confiscation be found, the valuation method used by the California commission will in all probability stand unchallenged and must serve as an important precedent in future rate cases.

Finally, there is the dissenting opinion of Justice Black in the Indianapolis Water case, the first expression of his views on valuation since he became a member of the court. Justice Black is strongly opposed to the use of reproduction cost as a major element in fixing the value of a utility's property. Pointing out how application of that theory has raised the fixed value of the water company's property far above its money cost, he is sharply critical of his associates for sending the case back for retrial with a pronouncement which he says must be interpreted by the lower court as requiring it to find a still higher value. Justice Black would have the Supreme Court keep its hands out of state rate regulation unless confiscation is clearly established.

From these signs it appears that a radical change in rate making and in the handling of rate cases is in prospect. It is safe to guess that in the future state courts will have wider scope and that their findings will give more weight to original cost rather than to the cost of reproduction.

PICTURES IN THE NEWS

Fairchild Aerial Surveys

NEW JERSEY PLAZA and approach to the New Lincoln Tunnel under the Hudson River to New York. In the center of the plaza, beyond the administration building, are the toll gates. The two tunnels, only one of which has been completed, swing southward from the crossing and emerge through the portals at the upper end of the plaza. Approach plans include a looping viaduct from the stub at the lower left which will swing back to connect with a depressed roadway across Union City and Weehawken as an outlet to main highways in the Hackensack Meadows seen in the upper background. Contract was recently let on this depressed way to George M. Brewster and Son, Inc., of Bogota, N. J., for $1,340,000.

Winter And The Waterworks

by W. W. DeBerard

Associate Editor, *Engineering News-Record*, Chicago, Ill.

Eau Claire, Wis., where frosts penetrate to 7 ft., observes cold weather precautions to guarantee uninterrupted supply

THE multi-colored foliage of fall brings home to the waterworks superintendent in the Northern states the fact that winter's strenuous duties will soon be upon him. Valves, hydrants, meters and services must be in shape to withstand frosts which may penetrate to 7 ft. or more, the depth to which mains are ordinarily laid. Ed Brown, superintendent at Eau Claire, Wis., was in this frame of mind when called upon in October. The following are some of the items which claimed his attention.

In this fast growing city of 32,000 population the 6,000-odd meters had just been read for the semi-annual billing—usually from 150 to 200 meters are reported by the meter readers as "dead," slow or leaking or needing attention. Some 150 had been brought to the meter shop for repair and test and 150 others put in their place. Eau Claire owns and services its meters so that they are interchangeable. If the meter register still functions a test is made "as found" and again after repair "as left" at another location.

A shop meter history is just being initiated on 5 x 9-in. cards which eventually will carry for each meter data concerning all tests made and reasons therefor, description, date bought and discarded, price, freight, total cost, inventory value at different intervals, the several dates of installation and removal, route number, location of set, property owner and date repaired. These cards are filed in the shop in numerical order under a utility number.

Tests are made using equipment which consists of a 3-cu. ft. vertical cylindrical tank with gage graduated below and above the even foot marks with even percentages "fast" and "slow," respectively. The reading is recorded in percentage accuracy with a permissible tolerance of 2 per cent either way; should it be a greater amount gears are changed to bring the reading within the limit set by the Wisconsin Public Service Commission, which has jurisdiction over city-owned utilities as well as over company plants. These regulations cover service, rates, and means of rate application. Due to corrosion Eau Claire meters favor the customer by slowing down—as time goes on as much as 10 per cent. Mr. Brown states.

About one meter a day comes in from reports of owners or plumbers. The complaint is usually leakage and occurs at the stuffing box from a corroded spindle. About 10 per cent of the 6,000 meters are in the shop for test and repair each year, making the average turnover once in 10 years but there is no schedule of removal and test although such a schedule has been considered. The majority of the meters were installed within the last 15 years, so that it is felt such a complete overhaul is probably due.

As to life of meters, Mr. Brown states that 28 years ago 750 meters were installed and most of them are still serving. He feels, therefore, that 40 years can be used as the life expectancy of a good meter. Meters are purchased in lots of 100, the department buying the type desired in the open market without taking bids. Repair parts are bought from the manufacturer.

Hydrant leakage tests

In winter all of the 730 hydrants are tested for leakage every week. One man does the job in 3 days. The procedure is to drop a ¼-in. rubber hose with a weight on the end down the hydrant barrel and on withdrawal note the depth of water, if any, which has wetted the hose. Those found leaking are reported to the hydrant crew. If the leak is small the water is pumped out. If it is likely to develop trouble because of freezing, and removal for repairs is impractical, about a gallon of alcohol is poured in. It is felt that the alcohol cannot find its way into the main since it must pass the hydrant valve and a valve on the branch. Valves are lacking on only eight branches on mains larger than 8-in., and these will in time have valves cut in. Further, the pressure runs around 100 lb., which is considered sufficient to preclude any alcohol penetrating to the mains. The dilution would be too great to be noticeable anyway.

During the extremely cold weather experiences all over the Middle West two winters ago, especial precautions were taken to prevent freezing of mains, hydrants and services. People were constantly advised to let the water run in streams the "size of a knitting needle." To protect mains, particularly dead ends, water was moved out of them every day by flushing. To reverse the direction of flow in the major portion of the system the pumping station was shut down for ¾ hr. every day and the water from the 3½-m.g. reservoir (which floats on the system) allowed to flow in reverse into the mains.

Despite these precautions water in 65 hydrant branches froze; they were thawed by two trucks equipped with steam boilers, operating every day. During this period crews with two light trucks worked continuously night and day opening all hydrants and after closure pumping and draining them. For thawing hydrants a 2½-in. jet of steam under 75 to 80 lb. was pushed down along the outside of the barrel. More than a hundred services were thawed. The department considers itself lucky, since a

single break in a main would have entailed closing several valves, which would have stopped circulation and induced many more freeze-ups.

Hydrant repairs in this city are expedited since but a single type is used. Spacing is about Underwriters' recommendations—one on each corner, the blocks running ten to a mile.

Mains and valves

The average length of main a single break would put out of service is 80 ft. in the business district, and 1,260 ft. in the residential area. In the early days it was necessary to cut off 2½ mi. Some 275 valves have been cut in with a valve inserting machine, and Mr. Brown feels that Eau Claire is about caught up with requirements of an up-to-date system. Whenever a trench is opened (as for a storm sewer) and a valve is indicated, it is slipped in. In the old company layout few hydrant branches had valves, but since then practically all branches have been supplied. Originally there were seven hydrants on the mains near the pumping station without valves. Immediately after the system was purchased the plant was shut down seven times to remedy this defect. Up to 12-in. size a test plug is used instead of a tapping machine.

River crossings are variously on bridges, in the river bed, in a trench beneath the bed or in a trench incased in concrete. The five on the bridges are insulated with felt covering. The five in the river have not shown any breaks from erosion and settling in recent years, but in the early days three breaks led to putting the lines in trench and enveloping them in concrete.

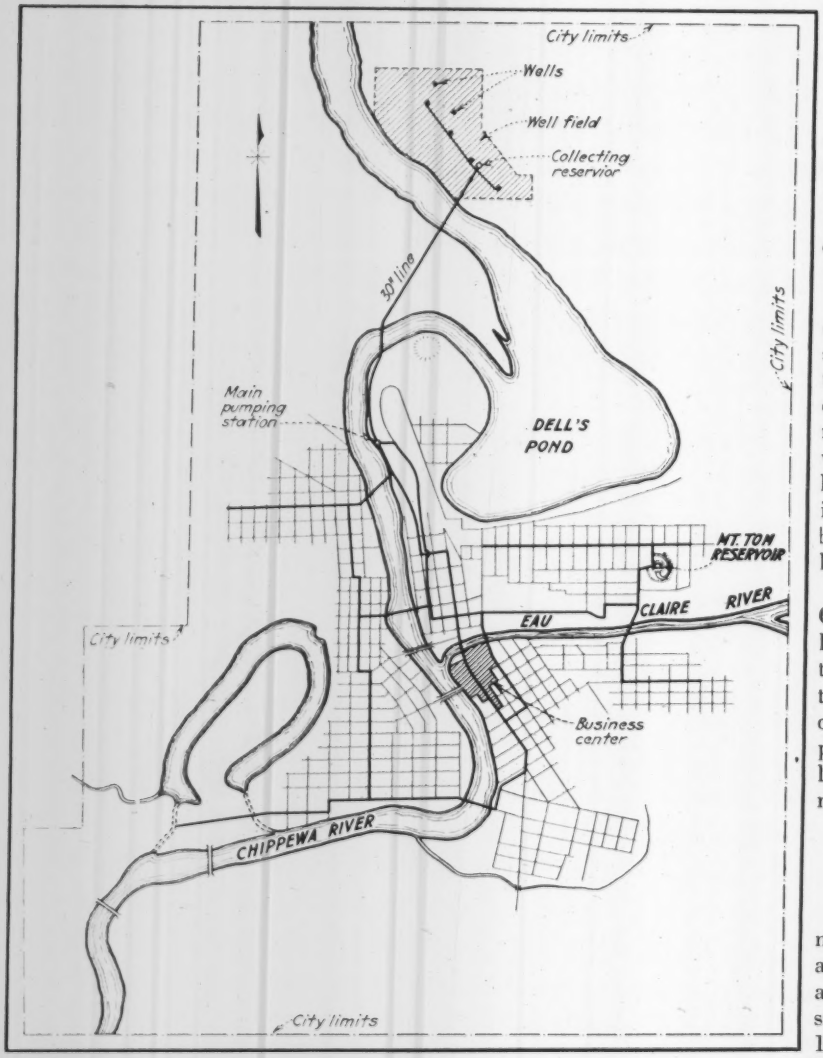

Fig. 1. Eau Claire waterworks system comprises a well field, main pumping station, 3½ m.g. reservoir and gridiron distribution system

Mains and valves

Of the 75 mi. of mains 23 were placed in the original private system in 1885. The city acquired the plant in 1909. Of the total 11 mi. are 4 in. and 45 mi. are 6 in. Pipe is all class C cast iron, inspected at the foundry and hammer-tested at the trench, but pressure is not usually applied before backfilling. As direct current is used in the city, there is little or no trouble from electrolysis.

The 647 valves require little maintenance since the yearly inspections cover an opening and closing operation, check for leaks, oiling of packing, and lubrication of gears on the large valves.

Removal of snow from streets and sidewalks has not made any concentrated exposure points for services in Eau Claire, because of the 7-ft. depth of cover. Perhaps the fine sand which is everywhere under the city has an effect. Because of it sheeting is needed for all trench work.

Some 150 new services were added on new houses in 1935. About the same number of houses, mostly in the outskirts, will be served by the end of 1937. The department does not install nor maintain services, which are cared for by licensed and bonded plumbers. A city plumbing inspector looks over the premises before the water is turned on at a new house.

Early service installations in Eau Claire were mostly wrought iron and lead, but recently flexible copper tubing has been added to the other two as a possible choice by the customer. Copper has become quite popular. Sizes are 1 in. for service lines, ¾ in. for taps and ⅝ in. for meters for domestic use.

Well supply augmented

Two wells added to the four in the new well field developed three years ago will make the superintendent's anxiety over a lack of supply less strenuous from now on. This new 165-acre field is across the Chippewa River from the former field in a flood plain of glacial sand and gravel

some 100 ft. deep to hard granite. The old field had a layer of disintegrated granite on top of the hard granite, indicating exposure at some past geological period. The disintegrated granite is said by geologists to be responsible for excessive amounts of iron and manganese; the latter eventually became so serious as to force the department to look for a new source. The present field was found by extensive underground explorations.

The water contains no iron, or only a trace. New wells are tested at 3 m.g.d. each and then pumped at 2 m.g.d. by motor units, three of 30-hp. and three of 40-hp. capacity. The water is discharged into a 20-in. field line leading to a central or equalizing reservoir, whence it flows 1¾ mi. by gravity in a direct line under the river twice (across a bend) to the high-service pumping station located at the dam and power house. Each of the wells has a station house over it of cut stone lined for insulation inside with large-size vitrified face brick. The ceiling is of an insulating wallboard. Double windows are provided for winter use and electric heaters, automatically controlled, keep an even temperature.

This constant temperature stabilizes the chlorine application which is required by the water as it issues from the well. Surprising as it may be this well water contains algae, protozoa and other growths which must be destroyed by chlorine on the way to the city pumping station. The ammonia and chlorine apparatus is in a separate annex room provided as part of the station house, the whole being heated by electrical current.

The current comes from the city-owned plant. The dam at the high-service pumping station is leased to the local power company for 77 years with a reservation of enough water to generate power for pumping and other city uses. Heating by electricity is of consequence entirely feasible from the economic standpoint. However, since outages are to be expected because of the river crossings and pole lines, a diesel-driven generator has been installed as standby in the main well station. A larger unit is contemplated, but this one can produce enough current to pump two wells, which would furnish sufficient water for the domestic load but not for the industrial load. One company alone, the Gillette Rubber Co., a subsidiary of U. S. Rubber Co., and fifth largest tire plant in the country, uses nearly 3 m.g.d. Air conditioners use 100,000 gal. daily, but of course only operate in summer, when the outages are likely to be at a minimum.

Emergency provisions

As another emergency provision against outages in the supply of electricity to the well field the telephone line wires are of the same weight as the power line wires and can be used as power line wires if needed. They are on the same steel towers as are the power wires.

Mr. Brown, reading of flood hazards this spring, looked over his main pumping station and found that an 1884 flood in the Chippewa rose to within 1½ ft. of his station floor. Some changes in the way of valves on drains have been made to eliminate trouble should a future Wisconsin flood exceed the 1884 record as much as the Ohio exceeded its maximum in February. Likewise in the well field some transformers in the basement of the main well station have been brought up and placed outside at an elevation some 15 ft. above the former setting.

While not a seasonal occurrence nor normal experience, a fire in the main pumping station Jan. 29, 1937, put the plant out of service completely for the better part of a day. A burning wood roof fell onto the turbine generators, pump motors and switchboards, putting everything out of commission through burning the insulation. With the aid of the local power company staff and many manufacturers who rushed in at once (even before the firemen had left the scene) a temporary switchboard was erected and wired from memory by one of the power company electricians. A large pump motor was rushed by truck to Minneapolis for rewinding; two others were started with only part replacement of windings on the ground; service was started some 15 hr. after the fire. Three standby gasoline engines on the opposite end of the pumps from the motors had not been used since installation in 1920. Of obsolete make, they were finally put into shape with new wiring, carburetors and all new outside parts within a period of 10, 12 and 14 hr. respectively.

During the fire emergency the industrial plants were cut off and by radio householders were requested to ration themselves. The 3½ m.g. reservoir thus was able to supply water to all services during the shutdown.

The station was being reconstructed at the time of the fire, which caught from falsework and spread to the temporary wooden roof. Greeley and Hansen, consulting engineers on the well improvements, had called attention to this possibility and the department was in the act of remedying the defect when the fire occurred. Everything in the station is new or has since been rebuilt since the fire. In October at the time the plant was visited, the place was being cleaned up and the temporary switchboard was being removed.

Within a week after the fire the insurance adjusters had made their report and the damages paid, so that the department could go ahead quickly unhampered by lack of ready funds. Originally the reconstruction had been partially financed through a 35 per cent PWA grant.

Few waterworks people realize, said Mr. Brown, the difficulties encountered when all supplies, tools and spare parts have suddenly been wiped out as in this case and must be obtained elsewhere. While all records were lost, duplicates were available at the city hall office.

Eau Claire has been served for 28 years by Ed Brown, superintendent, and for 30 years by C. G. Kasten, chief engineer of the pumping stations. While the city has no civil service these men and the dozen permanent employees all have long-term service records. Engineering for the department is handled by A. R. Garnock, city engineer.

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Disposal Surveys in Idaho

NATIONAL YOUTH administration workers and advanced chemistry, bacteriology and engineering students of the University of Idaho, under direction of State Chemist W. V. Leonard, are engaged in a survey of sewage disposal problems of Idaho cities. The surveys will seek to determine what type and size of sewage disposal plants are advisable in the various cities.

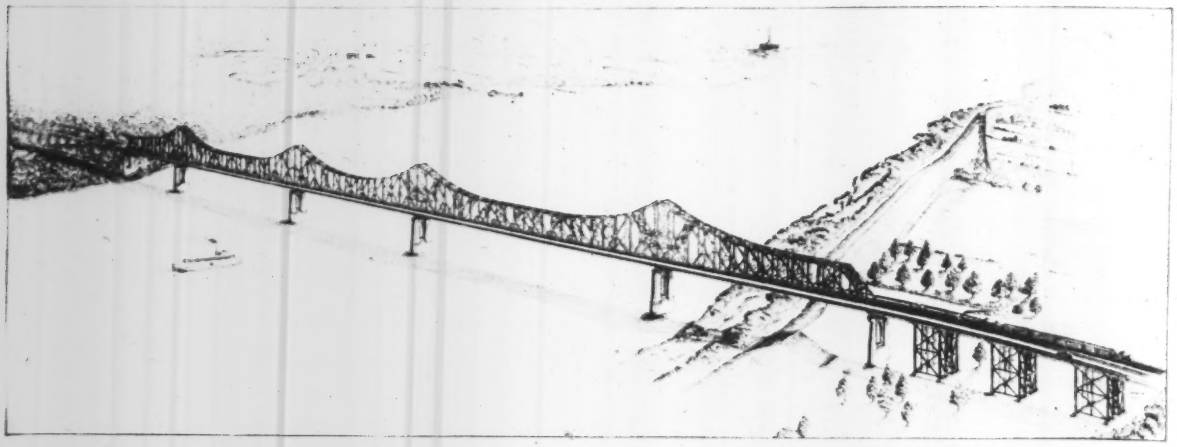

FIG. 1. A NEW HIGHWAY AND RAILWAY BRIDGE OVER THE MISSISSIPPI IS BEING BUILT AT BATON ROUGE

Deep Piers for Baton Rouge Bridge

Piers for combined highway and railway bridge over the Mississippi at Baton Rouge to reach depth of 180 ft. below low water level

NEW DEPTHS for river piers are to be attained in sinking the pier foundations for the combined highway and railway bridge now being built across the Mississippi River at Baton Rouge, La. Sunk by the sand-island method, two of the main piers in the river channel will go to a depth of 180 ft. below low water and a third pier will go to —160 ft. to reach a firm foundation. Piers of a similar bridge above New Orleans which were sunk by the same method reached a maximum depth of —170 ft. The only deeper piers are those of the Bay Bridge at San Francisco which go to about —230 ft.

Bridging the Mississippi River at Baton Rouge for both railway and highway purposes has been under consideration for many years; twice fairly complete plans were made for such a project, and in 1933 a proposal to build such a structure with PWA funds advanced almost to the point of calling for bids before the project was abandoned. However, the demand for a highway crossing at Baton Rouge to escape the long delay caused by inadequate ferry service continued and in 1936 the Louisiana legislature authorized construction of a joint highway and railway bridge. The highway bridge is to be toll free, financed in part with state funds and in part with federal-aid highway funds. Railways using the bridge will pay for the service on a lease basis.

Many factors entered into a determination of the site for the bridge, about six miles above Baton Rouge. Deep-draft navigation ends at the Standard Oil Co.'s refinery just above the city, hence a site to the north of the refinery made it possible to reduce the underclearance for navigation from 135 ft. above high water required for ocean-going vessels to 65 ft. for river vessels. Physical conditions also are favorable north of Baton Rouge as the bluff that forms the eastern limit of the alluvial plane of the Mississippi from Memphis to Baton Rouge is still about 50 ft. above the river to the north of the city at the site selected for the bridge, thus making possible a material reduction in the length and height of the approach fill and trestle required. Above the site the river makes a sharp bend to the west, leaving the bluff. By locating the bridge below the bend it will in no way interfere with future channel-straightening operations.

One disadvantage resulting from a position close to the bend is that wide openings must be provided for two navigation channels; one near the east bank for normal use and a high water channel near the west bank for use at time of flood.

Baton Rouge is a desirable point for highway traffic to cross the river as it provides a more direct route from the southeastern states to the states west of the Gulf than does the New Orleans crossing. Also, being northwest of New Orleans, a crossing at Baton Rouge gives a more direct route from New Orleans to the Central West than is obtained by using the lower crossing.

Possible advantages from a railroad viewpoint are found in the fact that two railroads, the Missouri Pacific and the Louisiana & Arkansas, have car ferries near Baton Rouge. The present plan is for the Louisiana & Arkansas to abandon its car ferries several miles above the bridge and build a new line over the bridge to a connection with the Texas & Pacific on the west bank, operating over the tracks of that railway to a connection with its own line about 15 miles to the west. No agreement has been made for use of the structure by the Missouri Pacific.

The main river crossing is to be a five-span continuous truss, 3,326 ft. long, consisting of two cantilever spans over the river channel, a central anchor span and two shore anchors. Trusses are to be at 32-ft. centers with the single-track railroad between them and roadways cantilevered outside the trusses. The two roadways will be 20-ft. between curbs with walks 2½-ft. wide on the outside. Shore anchor arms have spans of 490 ft.; the channel spans have cantilever arms of 226 ft. and suspended spans of 396 ft., a total of 858 ft.; the center anchor has a span of 650 ft.

Superstructures of the piers are to be of conventional type. The substructures of four piers are to be cellular concrete caissons capped with reinforced concrete slabs supporting the upper part of the pier.

Pier No. 1 is located in the east bank (at the left in the accompanying drawing) which is of dense clay sloping off fairly steeply into the river. Its substructure is a cylindrical concrete caisson 47 ft. 6 in. in diameter and having wall thicknesses of 9 ft. This pier is now under construction and will be sunk by open dredging to El. —80 or 10 ft. below the deepest point in the river. When the predetermined depth has been reached, a bottom seal of concrete 20 ft. thick will be placed by tremie methods.

A circular form was selected for this pier as giving greatest stability against possible bank movement should erosion of the bank occur.

Piers 2 and 5 are located above low water level, hence sand islands as constructed for piers 3 and 4 will not be required. Work on these piers will not be started until low water next summer. Their substructures are to be rectangular cellular concrete caissons, 63x82 ft. for pier No. 2 and 51x80 ft. for pier 5, each containing twelve dredge wells. They are to be sunk to —180 and —110 ft. respectively to reach a bed of packed sand having an adequate bearing value. As in pier No. 1, open dredging will be employed, the caisson being sealed with tremie concrete.

Piers 3 and 4 are in mid-river. They are to be sunk through sand islands following the method employed for the piers of the Suisun Bay bridge (*ENR*, Jan. 30, 1930, p. 174) and for the bridge at New Orleans (*ENR*, May 10, 1934, p. 589). Much of the equipment used on the latter bridge is being re-used for the Baton Rouge bridge. Some features of the process are patented by N. F. Helmers and M. F. Clements of St. Paul, Minn.

In the sand-island method of pier construction a timber mat revetment 250 ft. wide and 450 ft. long is laid on the river bottom to control scour. Through this mat long piles are driven to support a working platform, circular in form, within which a steel cylindrical shell about 120 ft. in diameter is built in sections and lowered to river bottom, 10-ft. sections being added until the steel cylinder extends well above normal flood level. Unusually long piles were required for the falsework for these piers as the water depths are somewhat greater than at New Orleans. At pier 3, the deepest part of the river, Douglas fir piles 135 and 160 ft. long were employed.

Mounted on the working platform at each pier are two revolving cranes equipped with 100-ft. booms for assembling the steel shell of the sand islands, placing concrete and filling and dredging the sand island and dredging the pier caisson.

For erection of the steel shell, A-frames are set up around the inside of the working platform and one complete ring of the shell is assembled on temporary supports below them, the shell being secured to the A-frame top by cables and blocks. When one or more rings have been completely assembled, they are released from their temporary supports and lowered by the blocks and falls until the top section is at deck level, when they are again secured to the working

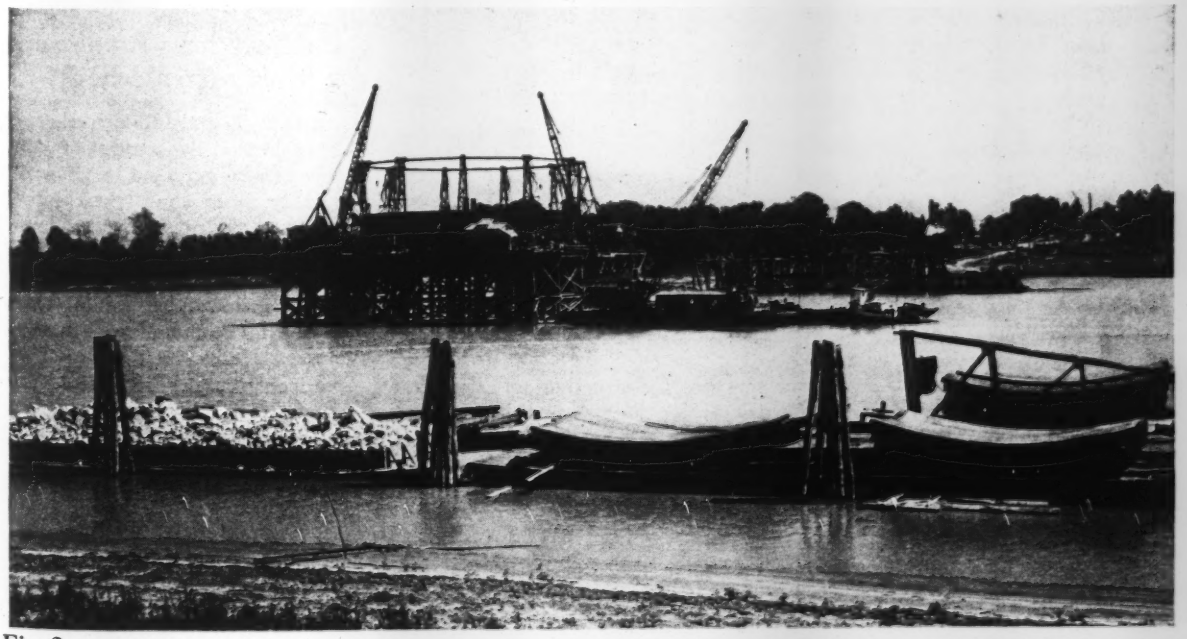

Fig. 2. Sand islands are being used in the construction of two piers in the river channel. In the midchannel is Pier 4 where falsework has been completed and the steel shell is being assembled. Beyond is the falsework for Pier 3.

Fig. 3. Concrete piles for the substructure of the east approach are being made close to the point where they will be required, forms being laid out along the line of the bridge approach.

platform while other steel rings are added. This process is continued until the shell has been landed on the bottom. The mat is then cut inside the ring and the bottom is dredged to obtain further sinking of about 8 ft.

The A-frames are then removed and the cylinder is filled to above water level with sand dredged from the river, thus permitting construction of the concrete caisson to be carried forward on dry land within the steel shell.

Steel forms are used for the caisson, those for the interior dredging wells being designed so that they can be lifted out between pours of concrete to permit dredging within the caisson. The caisson is carried up as the dredging and sinking progress, always keeping the top above water. Jetting wells are formed into the walls of the caisson and lubricating jets are provided in the outside walls near the cutting edge. As in the case of the other caissons, these will be sealed with tremis concrete after they have reached a firm bearing.

Pier 6, behind the levee on the west bank, is to be a reinforced concrete pedestal supported on wooden piles driven through 50 ft. of silty clay to hard sand.

Approaches to the bridge are to be earth embankments and steel towers carried on concrete pedestals. The steel work in the east approach for the railway line will be 3,411 ft. long, and on the west side, where the land is low, 5,297 ft., making the total length of the entire structure 12,034 ft. The railway has maximum grades of 1.25 per cent and the highway has a grade of 5 per cent, hence the latter comes to ground level much more quickly than does the railway, especially at the east end. The highway deck will not be on cantilever arms on the approaches but will be supported by tower legs.

Pedestal footings for the approaches are to be supported on precast concrete piles, the lengths being 50 ft. or less. Piles are tested up to 80 tons, but the maximum load will be about 30 tons.

Progress to date

At the end of the year dredging of the circular concrete caissons for Pier 1 was well under way. The sand island for Pier 4 had been completed and the second lift of the concrete caisson had been poured. Construction of the sand island for Pier 4 was in progress. No work had been done on piers 2 and 5 as they will not be started until after the high water next spring.

Work on piers 3 and 4 is being pushed in the expectation that they can be completed next spring. This will permit the steel contractor to begin erection of the center anchor span and of the two adjoining cantilever arms next summer. The working platforms around these two piers have their tops about 3[illegible] ft. above low water, or at a height sufficient to carry them through any thing except a major flood.

Concrete for the river work is supplied from a floating concrete plant, the New Orleans plant rebuilt. Concrete for the piles of the east approach is supplied by a plant set up near the center of the work. A large part of the piles had been completed at the end of the year and driving was in progress.

The bridge is being built by the Louisiana Highway Commission, H. B. Henderlite, state highway engineer, N. E. Lant, bridge engineer, and E. L. Erickson, construction engineer in charge of the bridge work.

Contracts for the six river piers are held by the Kansas City Bridge Co.; $2,421,980. Contracts for the main superstructure have been let to the Bethlehem Steel Co. for $3,705,855. The approach foundations are being built by the Uvalde Construction Co. of Dallas for $598,320, and the approach superstructure is to be built by the Steel Construction Co. of Birmingham for $1,634,563. The total cost of the bridge, including highway and railway approaches will be around $10,000,000.

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Public Works Employees Going To "School"

BETWEEN 80 and 100 men who work for the Detroit department of public works can be expected to know considerably more about their jobs in relation to the general city administration when they receive their "diplomas" sometime in 1938. They are enrolled in in-service training classes conducted two hours each week at Wayne University, reports the American Public Works Association.

Instruction is given not only in the many phases of public works—roads and streets, street sanitation, refuse collection—but also on general problems of municipal government. The Detroit example is one that a number of American cities are following to acquaint the men-on-the-job with new public works methods and with the workings of city government.

FIG. 1. BEGINNING WORK ON THE CONTRA COSTA CANAL NEAR OAKLEY, CALIF.

Progress on Central Valley Project

Start on Contra Costa Canal initiates $170,000,000 project to safeguard California against drought

CONSTRUCTION of the first four miles of the Contra Costa Canal, begun last October, is the first work to be undertaken on permanent features of California's Central Valley Project. The next 8 miles of this canal is to be contracted at an early date. Indications are that work in this division of the project can be kept ahead of construction at Shasta and Friant Dam sites, where preliminary requirements will entail delays. A comprehensive outline of the Central Valley Project was published in *Engineering News-Record*, Aug. 19, 1937, p. 299 and Aug. 26, p. 344. The following is a summary of the construction status on the big undertaking as of the end of the year 1937.

At the present stage the project divides itself naturally into four parts: (1) the Kennett division in the upper Sacramento Valley, which centers about Shasta Dam (originally Kennett Dam) and includes railway and highway relocation; (2) the Contra Costa Canal; (3) the canal and series of pumping plants in the northern (lower) San Joaquin Valley, and (4) Friant Dam farther up on the San Joaquin River, together with the two canals that will distribute water north and south from the Friant Reservoir.

The project is being constructed by the Bureau of Reclamation. The state is studying the problem of disposal and distribution of water, and operation will probably also be a function of the state and not of the bureau. It is contemplated that recognition will be given only to irrigation districts or other quasi-public organizations provided for in the state law. In other words, an individual water user will have to become a part of some recognized organization in order to get water. Much of this organization already has been completed.

Although it has been decided that power will be developed at Shasta Dam and no power at Friant Dam, details of power development are yet to be worked out. Thus far it has been announced only that firm and secondary power will be developed in quantities dependent upon releases of water from the dam. Summer releases will be for irrigation, navigation and maintaining fresh water in the delta channels. In winter the reservoir will be operated for flood regulation, storage capacity being reserved for this purpose.

By a decision announced in December (*ENR*, Dec. 30, 1937, p. 1036) the plan to use a railroad bypass tunnel at Shasta dam advanced by more than two years the date when construction of the dam can begin. It is now expected that bids on the dam may be called for in March 1938. This structure is to require 5,700,000 cu.yd. of concrete.

An agreement worked out in December between the bureau and the Southern Pacific Railroad, will leave to the railroad company all matters of locating and constructing the new main line, which will be about 37 mi. long and will include 12 tunnels and 8 bridges. One of the latter will be a noteworthy structure conveying railroad and highway (on separate decks) across the Pit River canyon which is to be flooded. This bridge will be about 3,300 ft. long and the highway deck will be about 470 ft. above present river level.

Preliminary investigations at the Shasta site are finished and exact location has been fixed. Work at the site included 5,487 ft. of exploratory tunnels, 181 ft. of shaft, 10,234 ft. of diamond drill holes, and 187 ft. of Calyx drill cores. At Shasta (as well as at Friant) work is under way on warehouses, family cottages, dormitories for about 125 men, and complete camp facilities in general for camps of 500 persons each. These structures, mostly rated at temporary buildings, have concrete foundations in some cases, and the warehouses have steel frames.

Contra Costa pumps and canal

The four miles of canal on which work began last fall in Contra Costa County, with completion date set for Sept. 9, 1938, is designed for an ultimate capacity of 350 sec.-ft., although initial pumping equipment will provide for only 210 sec.-ft. Bids will be called soon on the second contract, to cover the next 8 mi.

The total length of the Contra Costa canal will be about 50 mi. and the total lift (four pumping plants) 136½ ft. The intake for this canal is at tide level in the delta region, but the water supply at this point is to be kept fresh the year round by the release of water from Shasta Dam.

San Joaquin pumping plants

Field headquarters were opened last summer at Tracy for surveys of

canals and pumping plants on the San Joaquin between Tracy and Mendota. These pumping plants are to be dependent upon water from the Sacramento River, which will have access to the San Joaquin through improved confluence in the form of the delta cross channels. The pumps will raise Sacramento River water high enough to flow by gravity to irrigated areas of the southern San Joaquin Valley now supplied by San Joaquin River water.

Survey crews now working out of Tracy will bring together data on which to base decisions as to whether the line of canals and pumping plants will be built (1) in the river channel, (2) in the valley trough nearby, or (3) as a "high line" some distance back from the river on the west side of the valley. Of the three locations thus far considered all would have a capacity of 3,000 sec.-ft. at the north end, decreasing southward as withdrawals for irrigation are made. Locations in the valley trough and in the river channel would have 7 and 9 pumping plants respectively, each with an aggregate lift of 208 ft. The high-line location would involve a total lift of 226 ft., in 5 pumping plants.

Progress at Friant Dam site

Like the preliminary problem of railroad relocation which had to be worked out at Shasta Dam, Friant Dam has had an obstacle to overcome in the form of legal requirements involved in making transfer and exchange of waters and water rights. This is incidental to the plan for using Sacramento River water on certain low lands in the San Joaquin Valley in exchange for water to be stored behind Friant Dam whence it can be diverted at a level high enough for gravity delivery to areas now stricken by drought. Time is required for solution of complex legal matters involved in this exchange of water rights.

At Friant Dam site preliminary surveys and borings have been completed, and camp facilities similar to those at Shasta Dam site are under construction. Final location surveys are under way on both the canals to be served by Friant Reservoir; on the one to the south, which when completed will have a total length of 157 miles, location surveys have been carried to Kings River (about 30 mi.) where an important river crossing is under study.

In an address made in December before a meeting of the Associated General Contractors at San Francisco, Walker R. Young, construction engineer of the U. S. Bureau of Reclamation, outlined the general construction program contemplated in the Central Valley project and on the subject of progress had the following to say: "Field surveys are well advanced on all fronts. More than 70 mi. of main canal have been located and an additional 150 mi. of preliminary canal line have been surveyed. Some 50 mi. of railroad line on various proposed routes for the Southern Pacific relocation at Shasta have been surveyed, right-of-way appraisals have been completed on 15 mi. of railroad, 45 mi. of canal line, 990 acres at dam sites, 350 acres of gravel pit lands, and 680 acres of camp sites.

"Construction contracts awarded to date, although minor in character, exceed $600,000. * * * The Bureau of Reclamation has been making progress, all along, toward solution of the delicate problems involved in this complex undertaking. Not all of the progress has been of an obvious type."

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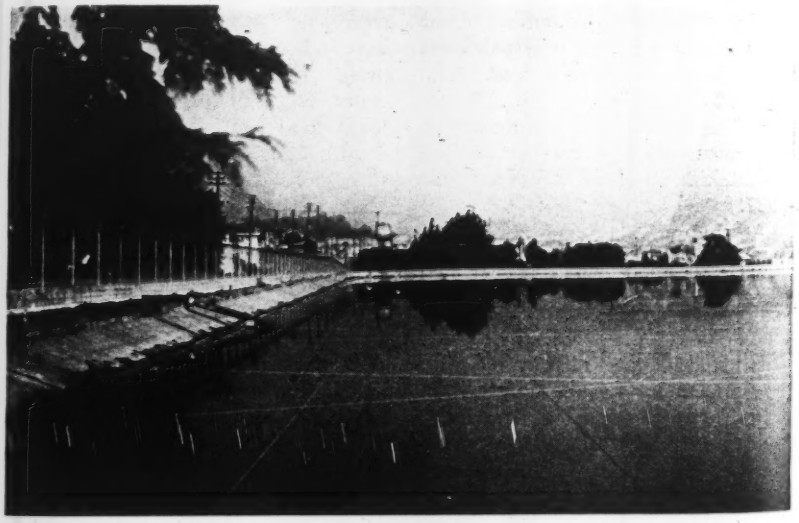
Protecting Reservoirs from Bird Nuisance

SAN FRANCISCO'S water department has kept sea gulls out of city reservoirs for many years by the simple means of stringing wires above the surface of the water. The plan was reported in *Engineering News-Record* as long ago as Nov. 5, 1925, p. 764, and in all the time that it has been in use confidence in its effectiveness has increased. The birds simply do not light on the water when a proper wire grid is in place.

When a new reservoir was built some years ago wires were strung as usual although in this case because of the larger area involved the spacing was made 50 ft. each way to reduce the cost required for the 30-ft. spacing used in earlier installations. The 50-ft. spacing put the wires too far apart; gulls occasionally alighted on this reservoir despite the wire grid, thus giving an indication of an upper limit in effective spacing. When some intermediate wires were put in, particularly a few diagonal runs, (because this was the cheapest way of decreasing the uniformly wide spacing) the nuisance was promptly stopped.

The conclusion of Water Department officials in San Francisco is that the spacing should be not more than 30 ft. apart, both ways, and perhaps a 25-ft. spacing would be the safer distance. The size of the wire is not important, the minimum diameter necessary to carry the dead load of the reservoir span has been quite sufficient.



When it was discovered that a 50 ft. spacing of wires did not keep sea gulls off the surface of this San Francisco reservoir, diagonals were added.

Overpass On Rigid Frame Bents

Frames are of various spans to clear railway tracks in special hip joint project at Sacramento

IRREGULAR SPACING of railroad tracks in the Southern Pacific freight yards at Sacramento, Calif., gave rise to an unusual problem in designing supports for a 24-ft. roadway which it was desirable to carry above the tracks as an overpass approach to the upper deck of the I St. bridge. The problem was solved by the use of two-hinged rigid frames made by cutting away the webs of girders and bending the flanges to conform to the desired curvature, thus making it possible to unite vertical legs and horizontal beams at the hip joint in integral construction. All but one of the frames are made from rolled sections and have spaces of 30, 32 or 39 ft. The one exception is a frame of 69 ft. span in which the members are built up of angles and plates.

The I St. Bridge is a two-level steel structure with roadway above and railroad tracks below, which crosses the Sacramento River on the western edge of the city. On the city side of the river the original approach to the upper deck was built with steep grades and sharp curves before the present day traffic requirements developed. To decrease approach hazards and to provide needed access to up-river points, two new approaches were planned to replace the one now outmoded. One of the new approaches, coming in on a line slightly south of east, is 786 ft. long and is known as the Third St. approach. The other, to which the following data refer more particularly, comes in from the north along the river, has a length of 919 ft. and is known as the Jibboom St. approach. The two approaches join at the eastern or city end of the bridge where the roadway surface is 28 to 30 ft. above street grades. No change is being made in the lower deck approaches.

Both new approach structures consist of steel frame supports with a concrete roadway on which maximum grades are 6 per cent. The two approaches are considered as entirely separate projects; the one leading up from Third St. is being built by the city of Sacramento, and the Jibboom St. approach is a federal aid project constructed at an earlier date and under entirely different conditions. Although both structures involve problems in keeping clear of surface tracks, the Jibboom St. approach is the more complex of the two because of the sharp angle it makes with a considerable number of railroad sidings.

In this approach, irregular span lengths and column spacings were required. Because of the necessity for leaving the tracks undisturbed, the supporting columns were located wherever spaces were available between tracks. For this reason, in a length of less than 800 ft., 12 of the 15 bents required to support the roadway were designed most economically as rigid frames. The other three are ordinary steel trestle bents which could be located where it was feasible to put column supports directly under the roadway. The rigid frame spans had to be designed for eccentric loadings because of irregularity of footing spacings. However, by this means the roadway was carried in the required location without impairing clearances in the switching yard.

The girder and legs of the 69 ft. rigid frame are made up of a 1-in silicon steel web 60 in. deep, with 2 in. of cover plates and 8x8x$\frac{7}{8}$ in. flange angles. The same members of the other frames are 33 or 36 in. rolled sections, the latter occurring in a maximum section weighing 250 lb. per foot. Where flanges were separated from webs at the junction of girder and legs, a torch was used to cut away interfering portions of the web to permit bend-

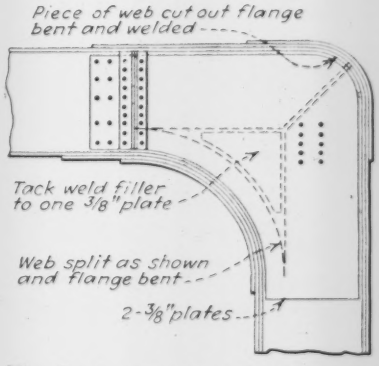


Fig. 2. Hip joint detail of rolled-section rigid frames in which web is cut and flanges bent to curve.

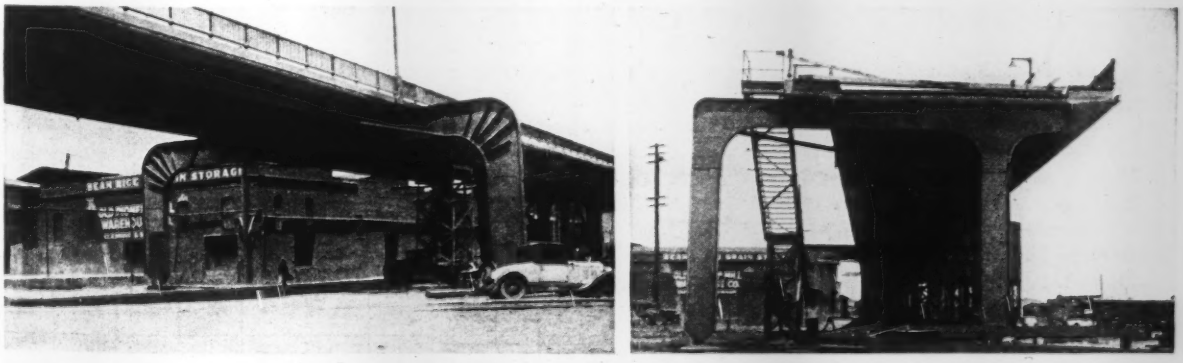


Fig. 1. Two of the twelve rigid frames in the Jibboom St. overpass in Sacramento. Left, frame of 69 ft. span. Right, a special frame of rolled section members. Remainder of frames are of this makeup without overhang.

ing the flange. Where a gore occurred after the lower flange had been bent away from the adjoining web, a triangular fillet was welded in place before the cover plate was put on. The hip joint was strengthened by radial stiffening angles on the 69 ft. span frame. By these simple expedients supports of adequate strength were provided and the cost of the fabrication was kept down to a very reasonable figure.

Conventional pin connections were used at the bottom of the columns, and the castings supporting the pins on the piers were designed with a shoulder to take any outward thrust that might occur as a result of the rigid frame design. The pins are 10 in. in diameter. Reinforcing was used in the concrete piers and because the piers had to be supported on piles it was thought advisable to put in a horizontal tie between each pair of piers below track level. These ties consist of 10x1¾-in. eye-bars encased in concrete.

Design of the steel frames was worked out by the bridge department of the California division of highways, F. W. Panhorst, bridge engineer and Harvey D. Stover, designing engineer.

Influence Lines By Moment Distribution

by F. KRUYS

Engineer with the Bridge Bureau of the State Water Department, The Hague, Netherlands

Simple modification of Hardy Cross method gives necessary influence line ordinates and requires only two distributions for member

INFLUENCE LINES for the moments at the joints in continuous frames can easily be obtained by the Hardy Cross method of moment distribution. The procedure, here described, is adapted both to structures in which no joint translations occur and to simple cases of structures with joint translations.

When no translations are possible, and only one member of the structure is loaded, the value of the moments outside of the loaded member is dependent upon the magnitude of the end moments of this member. The Cross method of moment distribution provides a simple way of determining joint moments, if the fixed-end moments of the loaded member are known. These fixed-end moments are easily found, but distributing them for all required load positions would make the process of constructing influence lines a tedious one. However, the work is simplified by distributing the fixed-end moments separately.

According to the principle of superposition, the value of any joint moment is equal to the sum of the two joint moments found by separate distribution. Each of these two joint moments represents a certain percentage of the corresponding fixed-end moment, which percentage is constant for any position of the load in the same member. Distribution of unit moments at the two member ends will furnish the percentages for all the joint moments of the structure, and to determine the total influence lines it is sufficient to use only two distributions per member. For every influence ordinate, then, two fixed-end moments have to be reduced to corresponding percentages and added.

For illustration consider the continuous beam in Fig. 1a with four spans of uniform cross-section. The ends *A* and *E* are hinged. The figures

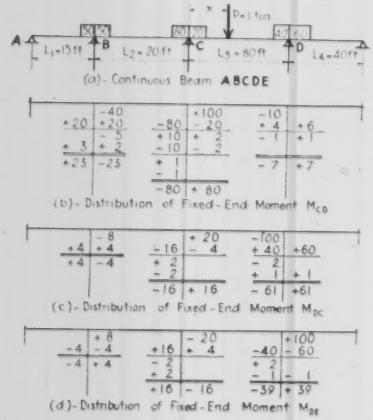


Fig. 1. Determining percentages of fixed-end moments for computation of influence line ordinates

Table I: Influence Ordinates for a Unit Load in Span L₃, Fig. 1.

X/L	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	
$M_{CD} = -PL_3 \times \ldots$	0,081	0,128	0,147	0,144	0,125	0,096	0,063	0,032	0,009	
$M_{DC} = -PL_3 \times \ldots$	0,009	0,032	0,063	0,096	0,125	0,144	0,147	0,128	0,081	
$-0,23\ M_{CD} = +\ldots$	1,49	2,35	2,70	2,65	2,30	1,77	1,16	0,59	0,17	Foot-tons.
$-0,04\ M_{DC} = +\ldots$	0,03	0,10	0,20	0,31	0,40	0,46	0,47	0,41	0,26	Foot-tons.
$M_B = +\ldots$	1,52	2,45	2,90	2,96	2,70	2,23	1,63	1,00	0,43	Foot-tons.
$+0,80\ M_{CD} = -\ldots$	5,18	8,19	9,40	9,21	8,00	6,14	4,03	2,05	0,58	Foot-tons.
$+0,16\ M_{DC} = -\ldots$	0,12	0,14	0,81	1,23	1,60	1,84	1,88	1,64	1,04	Foot-tons.
$M_C = -\ldots$	5,30	8,60	10,21	10,44	9,60	7,98	5,91	3,69	1,62	

Table II: Influence Ordinates for Unit Load in L₄, Fig. 1.

X/L =	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9
$M_{DE} = -PL_4 \ldots$	0,085	0,144	0,178	0,192	0,187	0,168	0,136	0,096	0,049
$M'' = +0,04\ M_{DE} = -$	0,14	0,23	0,28	0,31	0,30	0,27	0,22	0,15	0,08
$M_C = -0,16\ M_{DE} = +$	0,54	0,92	1,14	1,23	1,20	1,07	0,87	0,61	0,31

enclosed in small boxes at the joints are multiplication factors to be used in the distribution. Suppose that the ordinates of the influence lines for M_B and M_C in L_3 and L_4 are to be determined.

In Fig. 1*b*, *c*, and *d*, the distribution is shown of fixed-end moments with the numerical value of 100 applied at the ends *C* and *D* of L_3 and L_4. The end moments, resulting from these distributions, represent the required percentages.

Table I gives the computation of the ordinates for M_B and M_C in L_3 for nine positions of a unit load *P* at a distance *x* from the left member end. The fixed-end moments are equal to PL_3 multiplied by a coefficient, the value of which is a function of x. In the second and the third line of the table these moments are given for the varying load positions. The value of the coefficient is easily calculated and can be utilized for any bar of uniform cross section with two ends fixed.

The fourth line contains the moments of the second line reduced to the percentage of joint *B* from the distribution of Fig. 1b, and the fifth line the moments of the third line reduced to the percentage of joint *B* in Fig. 1c. The final values of M_B are obtained by adding the fourth and the fifth line. A similar computation is given for M_C. The sign convention for the moments in the table is that ordinarily given for horizontal beams.

Table II contains the M_B and M_C values for a load in L_4. The second line gives the fixed-end moment M_{DE} for a load at a distance *x* from *D*. No adding of two moments takes place in this table because there is no moment at the right member end. The M_B values for a 1 ton load in L_4 are given in the third line of the table. The values for M_C are given in the bottom line.

It is to be noted that the numerical values of the figures in Fig. 1b and Fig. 1c are the same except at the joints where the unit fixed-end moments are applied. It follows from this that one distribution per joint is sufficient to obtain the percentages. At every joint the unit fixed-end moment has to be shifted to the different member ends, always taking care of the proper sign.

In frames where joint translations occur, the joint moments are dependent not only upon the value of the end moments of the loaded member but also upon the magnitude of the translations, and the problem become difficult. Only simple cases can be treated, for example the single-story frame in Fig. 2, in which only one joint translation, that of the horizontal girders, is possible.

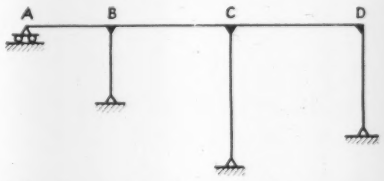


Fig. 2. Frame with one joint translation possible for which influence line can be determined.

When applying the method to frames like these, the only change in the procedure is created by the requirement that, for every case of loading, the total horizontal shear in the structure be zero. Suppose that the influence lines for the joint moments in Fig. 2 have to be determined for a load moving from *C* to *D*. This can be done by the following steps:

(*1.*) A unit fixed-end moment M_{CD} is applied at *C* and distributed, allowing no sidesway.

(*2.*) The process is repeated for a moment M_{DC} at *D*.

(*3.*) A horizontal force is applied at *A*, while the girder joints are held against rotation, so inducing moments in the column top. These moments, for every column dependent upon the value I/L^3, are distributed.

(*4.*) The moments from Step 1 are combined with those from Step 3, after the latter have been multiplied by a factor of such magnitude that the total horizontal shear in the frame equals zero. The resulting moments may be used as percentages for reducing the fixed-end moment M_{CD}, in the same way as described in the first example.

(*5.*) The process is repeated for the moments from Step 2 and 3.

(*6.*) Fixed-end moments M_{CD} and M_{DC} are calculated for all load positions required.

(*7.*) For every load position the fixed end-moments are reduced to their proper percentages and added, in this way producing the influence ordinates.

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Red River Valley of the North Plan Reported by Resources Committee

THE STATES of Minnesota, North Dakota and South Dakota have recently agreed to carry out a program for the full use and control of water in the valley of the Red River of the North, according to a report of the National Resources Committee. This report presents a plan and a detailed program of water development and contains water conservation plans for the watershed, which drains the three states party to the agreement. It includes projects ranging in size from small dams and lake improvements to relatively large reservoirs and municipal water supply works.

It has been determined that the major water problem of the area is the conservation of run-off in lakes and reservoirs and its release to stream channels at a rate which will provide, at the principal cities, a dependable supply of water of good quality; abatement and prevention of stream pollution is an essential part of the plan.

Levels of many of the lakes in the watershed would be raised somewhat in order to provide an increased storage of groundwater, if the plan goes into effect. Small dams are proposed on various normally dry channels to impound water for stock and to meet other rural needs. Particular consideration is given to the stabilization of lake levels. In view of the probable occurrence of floods there from time to time in the future, the interstate committee plan contains provision for flood-flow correction.

Although preparation of the plan and program has been primarily an interstate activity supervised by the Interstate Committee, the Water Resources Committee of the National Resources Committee and other federal agencies have provided consulting and technical services. Many of the investigation and construction projects recommended have been finished or initiated since the study was completed.

Six-Point Pickup For 10-ton Timber Trusses

Halves of the 200-ft. trusses for exposition buildings at San Francisco lifted bodily and set in place

ERECTION of skeleton timber frames has just been completed on six exhibit palaces for the 1939 Exposition at San Francisco. The structures consist essentially of 200-ft. 3-hinged arches; two of the buildings are 886 ft. long and the erection plan was worked out on the basis of assembling the trusses in halves on the ground and lifting the two halves separately. This plan was facilitated by the use of a 4-legged tower beneath the central pin of the arch which served as a working platform on which the upper ends of the two halves could be brought together and the central joint completed. An important feature of the operation was the arrangement of a six-point pickup by means of which the framed timber assembly could be raised to position without adding any members not required in the completed building.

Erection problem

Each half of the 200-ft. arch frame weighed 19,800 lb. In working out the scheme of erection the problem was to find a method that would avoid excessive stresses in the members and yet would be so convenient that good speed in erection could be made. As a practical aid in solving the problem an 8-ft. model of the half arch, scaled to size and weight, was built up. Weights and stresses were computed and a six-point pick up was arranged using cords and small pulleys to equalize loads at all six points. Experiment with the model led to selecting the points of attachment indicated in the accompanying drawing. With connections at these points, the trusses were lifted without undue delay in "rolling" (as the erection crews called it) from the horizontal to the vertical position of the arch frame.

The reaction figures given in the accompanying drawing were those that obtained before the truss was lifted entirely free of the ground and while the assembly still rested some weight at the two ends. The end loads are marked in the drawing "ground reactions."

In this nearly horizontal position and before the truss was rolled into a vertical plane, the reactions at points of attachment (for which figures are given on the drawing) caused maximum erection stresses in the arch members.

In accordance with this plan the 21 arches which constitute the entire structural frame for each of the two northerly exhibit buildings, were lifted to place speedily with movements of the arch coinciding very closely with performance indicated by the model experiments. When a half-truss was ready for erection, and after connections of the hoisting cables had been made, the assembly was lifted into position in an average erection period of 5 minutes. (Two cranes with 85-ft. booms were used, one for each half-truss.) About half an hour was then necessary to place the pins, bolt up the joints and generally complete the connections

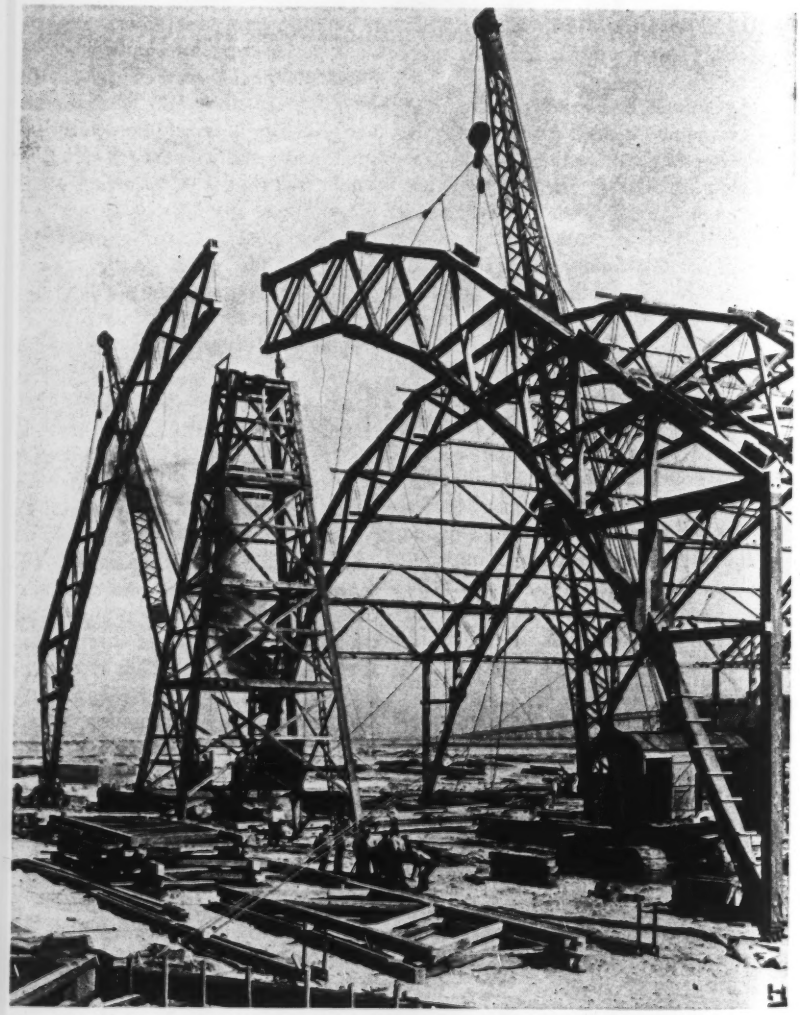

Fig. 1. The halves of the 200-ft., 3-hinged arches were lifted bodily to place and central joint was made from the top of the working tower.

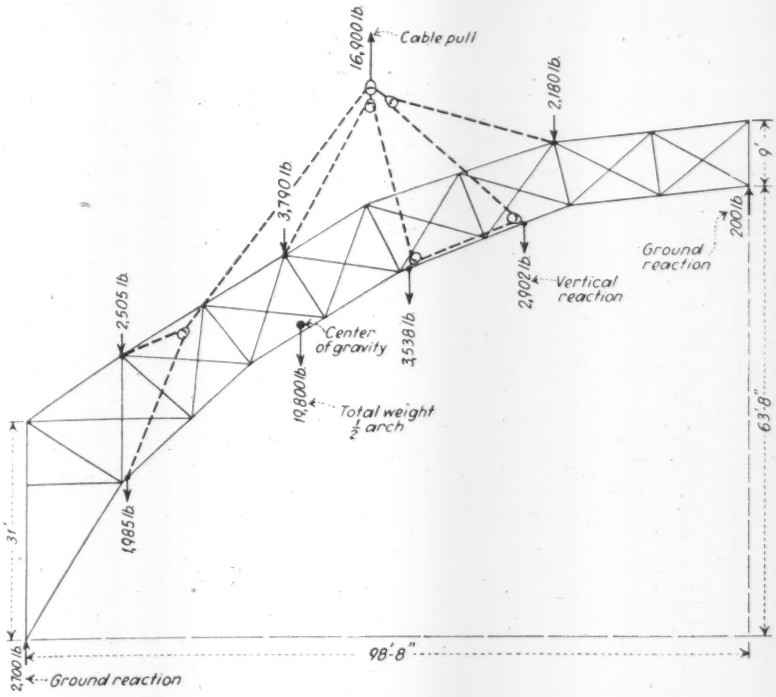

Fig. 2. Diagram showing the six-point pick-up and reactions for the near-horizontal position when erection stresses are greatest.

at the crown of the timber truss arch.

A 4-post tower used in each building as an aid to the assembly process was of design and strength such that the approaching ends of the truss halves could be rested on the top of the tower as a working platform and there brought together. This feature of the erection program greatly expedited the work. After completion of each arch the tower was moved by one of the cranes into position for the next ensuing arch.

The erection of the timber structures is notable in that 10,000,000 ft. b.m. of lumber was placed in about 20 weeks. Repeatedly four of the 200-ft. arches were erected in an 8-hr. day and the framing of one building including walls, roof and floor of 175,000 sq. ft. area was completed in about 8 weeks.

Personnel

The general contractor for the six main exhibit palaces, involving about 800,000 sq. ft. of floor area, is the Guy F. Atkinson Company. All construction is under the direction of W. P. Day, vice-president and director of works, Golden Gate International Exposition. H. C. Vensano is chief of construction, and John J. Gould is chief of the division of structural engineering.

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New Welding Research Results

THREE PAPERS delivered at the fall meeting of the American Welding Society furnished some significant results from current structural welding test work.

At Lehigh University, tests of beam-column connections have indicated that a detail using top angles to provide the end restraint and seat angles to carry the vertical load are satisfactory. Upon such connections sustained and repeated loadings do not have an appreciable effect when the top angle deflection is not excessive. The use of 3x3-in. top angles of various thicknesses will produce satisfactory beam connections providing for 50 per cent restraint. The practical range of spans of beams for 3x3-in. top angle connections is between 8 and 18 ft. This type of top angle connection is best adapted for light-weight wide flange beams.

In another series of tests at Lehigh, girders with inclined stiffeners were investigated, with the result that the strength of the girder was shown to be materially increased when stiffeners are put to work by inclining them in the direction of the compressive stresses in the web. The investigation so far is but the first step in a larger project which will study the best angle of inclination for the stiffeners and devise a suitable design method for this girder.

At the University of Illinois, tests of butt welds have indicated that the fatigue strength (the maximum stress to which a weld can be subjected 2,000,000 times without failure) of joints in carbon steel plates in the "as welded" condition is reduced by the stress concentration at the edge of the weld due to the change in section, and that it can be increased by planing off the excess weld metal. Also, the fatigue strength of welds of carbon steel plates is slightly greater for specimens welded with the automatic carbon arc than for those welded with the hand-operated metallic arc. For welds in silicon steel plates the fatigue strength is limited to that of the filler metal. Peening the beads has practically no effect, and stress relieving by heat treatment has but little effect on the fatigue strength of the welds. The unit fatigue strength of a properly made butt weld in the "as welded" condition, according to the tests, was about 88 per cent of the fatigue strength of the same plate in a riveted joint, the former being computed on the basis of the gross and the latter on the basis of the net section of the plate.

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Modern Highway Standards

PLANS for a relocated main highway between Pewaukee and Oconomowoc, Waukesha County, Wis., 22 mi. long, provide for a divided four-lane road consisting of two 20-ft. strips of pavement separated by a 30-ft. parkway, all on 150-ft. right-of-way. Curves are limited to 5 deg., and both curves and grades will be laid out for 1,000-ft. minimum sight distance. The relocation will also carry the highway around villages, although village merchants oppose the by-passing as taking traffic and potential business away.

FROM FIELD AND OFFICE

Working problems and time-saving methods . . . Edited by Charles S. Hill

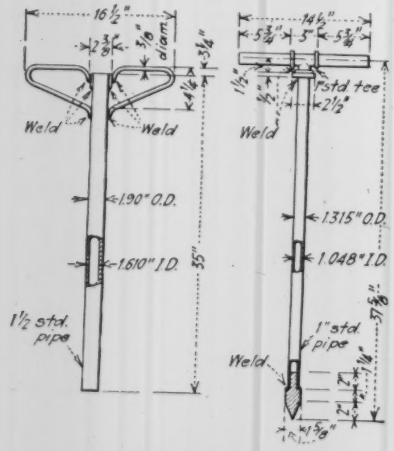
Tool for Driving Blast Holes In Soft Earth

by L. F. LIVINGSTON
E. I. duPont de Nemours & Co.,
Wilmington, Del.

There has always been some type of core punch-bar for making holes in a type of soil where the hole will not remain open of its own accord until dynamite is loaded therein. These tools, mostly, have been makeshifts in that, particularly in sandy soil, it was seldom possible to place dynamite at the desired depth.

The core punch bar illustrated uses a 1½ in. pipe,, with handles attached, as an outside shell. The core which fits inside the shell is made from 1-in. standard pipe, having a steel point on the lower end 1⅝ in. in diameter and a pipe T-handle on the upper end. The point fits closely inside the shell, but the core pipe fits loosely so that any material sliding by the point will not foul the core. There are two steel rings: One welded to the top of the core, and one welded on the top of shell; these are the key to the lasting quality of the tool.

The core is placed inside the shell and the two together are pushed as far as possible into the ground at a point where a load is desired. The handle of the core is then swung at right angles to the handle on the shell; the core then becomes a pile driver to drive the shell to any desired depth. The point on the core extends below the shell so that at each stroke the point goes through the end of the shell, wedging out any material which might enter the shell and forcing material below the shelf to one side. At the same time, a steel ring at the top of the core hits the shell at each stroke, driving it deeper into the soil. When the shell has been driven to the desired depth, the core is removed, and the dynamite is dropped into place, and can be held there with a wooden tamping stick while the shell is pulled free. The device was invented by H. O. Ashley of Sibley, Ill.



The line drawing above and the photograph below illustrate the principle of the blast hole tool.

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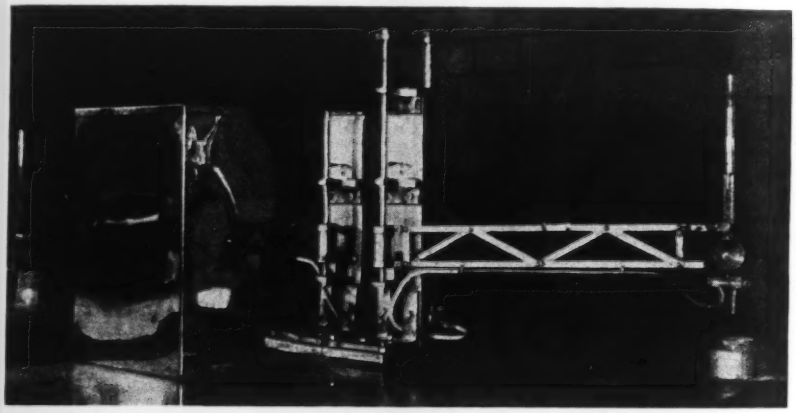

This device automatically measures mixing water for cement briquettes.

Calibrated Mixing Water

by H. F. HEDDERICH
Superintendent, Physical Laboratory,
Indiana Highway Commission,
Indianapolis, Ind.

Some time is saved by the device illustrated in measuring the water for a cement test briquette. This device consists of a burette graduated from 90 to 125 milliliters, mounted on the end of a swinging arm, and connected by flexible tube through a two-way stop cock to a constant level tank. Level in the tank is maintained by a very sensitive float valve. The arm carrying the burette is adjustable for height so that varying amounts may be drawn into the burette. A pointer mounted on the arm moves along a graduated scale, indicating the level in terms of milliliters of water which the burette will contain.

In use, the operator empties the previously adjusted and filled burette into one batch of mortar, adjusts the height so that the burette will fill to the proper point for the next batch, turns the stop cock to connect the burette to the constant level tank and swings the arm to one side. This entire operation takes only a few seconds and in cases where a change in adjustment is unnecessary the only time required is the discharge time of the burette. By the time the operator is ready for the next batch the burette will contain the proper amount of water and the procedure is repeated. The device is

much more accurate than a graduated cylinder and gives a very appreciable saving in time.

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Little Aids for the Laboratory

by B. E. Rutz
Testing Engineer,
Bureau of Materials,
New Mexico State Highway Department,
Las Cruces, New Mex.

A Hot Plate—One of the least expensive and most satisfactory pieces of laboratory-built equipment in the New Mexico state materials laboratory is a large electric hot plate for drying samples of aggregate or other materials. The plate is operated on a 220 volt line and attains a temperature of about 110 deg. C. The construction cost was about $15 and the plate has given several years of excellent and continuous service. It was built as follows: To the under side of a piece of sheet iron ¼ in. thick, electric-iron elements were bolted, connected six elements in series for each circuit. Each element was covered with a piece of sheet asbestos and a piece of 28-gage sheet iron. The elements were fastened to the plate by drilling holes in the plate and the asbestos and sheet iron cover plates to match those in the elements. Bolt holes in the top of the plate were counter sunk to take the heads of the 3/32 in. bolts used and these holes were filled with iron cement to make the top of the plate smooth. Each series of six elements was connected to two line wires carried on insulators bolted to the plate. Sturdy legs were made from ⅜x1¼-in. strap iron.

An Acid Container—The materials laboratory makes its own receptacle to hold the antimony chloride-hydrochloric acid solution in making spelter determinations on spelter coated metal. Instead of the usual beaker, the laboratory finds the lower portion of an ordinary storage battery cell a much more convenient container. The specimens tested are 2¼x2¼ in. and this receptacle will contain the required solution and run three specimens at one time. The reinforcing ribs on the bottom of the cell serve to separate the specimens; hold them in a semi-upright position; allow free access of the acid to all surfaces, and facilitate the placing and removal of specimens.

A Water Measure—A handy device for measuring the water used in making concrete test specimens is made by placing a glass gage on the front of a metal container 4 in. square and 24 in. long which is fastened to the wall near where concrete test specimens are made. Calibrated in cubic centimeters and gallons, the container is fitted with an overflow pipe near the top and is connected directly to the water system by a small-diameter pipe with a shut-off valve. A rubber hose is connected at the bottom of the container and a valve is fastened to the end of the rubber hose conveniently to add the water to the concrete in mixing basin.

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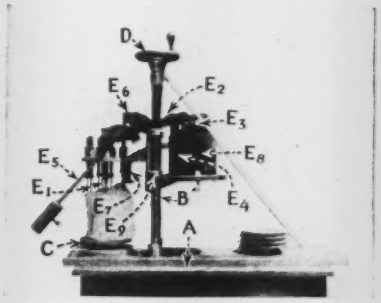
Measuring Core Depth

by W. H. Mills, Jr.
Testing Engineer,
South Carolina State Highway Department,
Columbia, S. C.

Many devices have been developed that try to eliminate the personal factor and at the same time provide an accurate and quick determination of the thickness of cores cut from concrete pavement. The device illustrated was developed in the laboratory of the South Carolina highway department and has been used there for over five years.

The machine consists of a base plate to which the uprights *B* and the measuring plate *C* are fastened. The hand wheel *D* at the top of the stand controls the raising or lowering of the measuring point frame *E* by a screw. The measuring point frame *E* has a stationary measuring point *E-7* and nine movable points *E-1*. The stationary measuring point is located immediately above the measuring plate *C* and the distance *B*, just above the lower guide *E-9*. The nine movable measuring points *E-1* are connected by levers *E-2* to floats *E-3* in a container *E-4*. Weights *E-6* which operate separately over each lever *E-2* are attached to the main lever *E-5* so that when it is in the down position all of the points are forced to the lowest position. This position is about 1 in. below the surface of the stationary measuring point.

The container *E-4* has a scale *E-8* graduated in inches and tenths on the side. The liquid in this container is kerosene and it is adjusted so that when all measuring points are at the same elevation as the bottom of the stationary measuring point, the reading of the liquid is at zero on this scale. To obtain this zero point a cylinder having a smooth surface is placed on the measuring plate and the measuring point frame lowered by the hand wheel until the stationary measuring point is in contact with the surface. The lever *E-5* is turned so that it is in a down position which forces all measuring points in contact with the cylinder. As the cylinder has a plane surface all measuring points are at the same elevation as the bottom of the stationary measuring points and the liquid is adjusted to read zero on the scale. This adjusting should be done each day cores are to be measured.



This device averages roughnesses on core bottom to get exact pavement depth.

For measuring the smooth surface of the core it is placed on the measuring frame *C*. The measuring point frame is lowered so that the stationary measuring point is slightly above the highest point on the core. The lever *E-5* is turned to the down position and the weights *E-6* force the movable measuring points to contact the surface at various points. The distances of each measuring point below the stationary measuring point is automatically averaged by the floats in the liquid and recorded on the scale *E-8*. Therefore, the thickness of the cores is obtained by reading the measurement on the graduated uprights *B* and subtracting the reading on the container *E-4*.

This device has increased the speed in measuring cores and gives the laboratory more confidence in the results which are reported.

Wet Drilling for Silicosis Control

Close cooperation between rock drill makers and state labor authorities in developing practical regulations for the application of New York's Silicosis Act has developed a wet drilling code whose approval is in early prospect

ACTIVE COOPERATION of rock drill manufacturers through their organization, the Compressed Air Institute, marked the development of dust-control measures for the prevention of silicosis, as required by the New York Silicosis Act, recently discussed in our columns (Dec. 30, 1937, p. 1058, and Jan. 6, 1938, p. 11). Information concerning this cooperation, received since the publication of our editorial of Jan. 6, in which the rock drill manufacturers were criticized for lack of interest and cooperation in working out the problems of the Silicosis Act, reveals that they have been active in the matter since passage of the act with a view to making the act effective as completely and as early as possible. The following account of their work gives information important to all concerned in rock drilling and silicosis control.

Study of the dust problem has been carried on by individual rock drill manufacturers for years. Organized action through their industry association, the Compressed Air Institute, began at the time the Secretary of Labor called a silicosis conference at Washington, April 14, 1936. Following this conference, which was attended by the secretary of the Institute, the organization by resolution formally expressed its belief that "the use of wet drills, water spray and proper ventilation is the most satisfactory means of prevention of silicosis in rock drill operations."

Passage of the Silicosis Act by the New York state legislature, effective June 6, initiated direct cooperation of the Institute with the state supervisory authorities. The law, which requires the use of approved devices for the elimination of silica dust, is under the administration of the Commissioner of Labor and Industry. On July 2, 1936, Commissioner E. F. Andrews invited the Institute to join in forming an advisory committee to prepare rules and regulations for the administration of the act in respect to rock drilling. In response to the invitation the Institute appointed E. H. Dickenson (J. I. Edwards, alternate) who have worked continuously on the committee ever since, assisted at times by other representatives of drill manufacturers.

Permissible limit of dustiness was one of the subjects of action at the first meeting of the advisory committee on July 29, 1936. A medical subcommittee appointed on this subject reported its recommendations on Sept. 30, which were accepted by the advisory committee and referred to the commissioner on Oct. 8, 1936. Rules and regulations for dust control in rock drilling, as recommended by the advisory committee, were presented by the commissioner at a public hearing on Jan. 29, 1937. They were approved and became effective May 1, 1937.

Notice of approval was issued by the state on May 3, and as soon as possible thereafter, May 21, the Institute made application to the commissioner for approval of wet drilling with ventilation as a dust-control measure. A list of 94 drills accompanied the application, but without specification of the quantity of ventilation required, on the view that the amount of ventilation would depend upon local conditions. Arrangements for tests of the drills preliminary to approval were begun by the state officials shortly thereafter.

Discussion of the testing problem by Deputy Commissioner Geo. P. Keough and Mr. Dickenson brought out that the state had no facilities for such tests or for investigation of the required amount of ventilating air. The Letchworth Village site at which tests of exhaust type control devices had been made in November, 1936 (*ENR* Dec. 3, 1936, p. 780) was considered unsuited to the present tests, and it was decided to make the tests at a location and with facilities provided by the Compressed Air Institute at Tott's Gap, Pa.

Actual testing began in June, 1937, and the first comprehensive report of results was drafted on Sept. 9. Work continued until November, when cold weather interfered.

As far back as October, 1936, the Compressed Air Institute notified the General Contractors Association of New York that the drill manufacturers stood ready to cooperate with the contractors in relation to the dust control problem. The contractors took advantage of this offer in the Fall of 1937, when a special group of the association, with B. F. Tillson as consultant, started development of dust-control methods for the Sixth Ave. subway work. The manufacturers furnished the contractors, at their request, all information on silicosis available to them, and also made for them drilling tests with wetting agents.

Utilizing their own test data and those of the Tott's Gap trials, the contractors submitted an application to the commissioner for approval of wet drilling with ventilation on Oct. 22, 1937. The state at a hearing on Dec. 17 presented a proposed code of wet drilling and ventilation, based on the Institute's application and the Tott's Gap tests. At present this code together with the rules suggested by the contractors in their application is before a new advisory committee.

A recommendation of this committee to the commissioner is expected shortly. If favorable it should lead to early approval of wet drilling with ventilation as an accepted method of dust control under the Silicosis Act.

New Test Data On Paving Brick

Testing engineers bring out radically new facts at the annual meeting of the National Paving Brick Association held at Cincinnati

RESEARCH continues to be the active interest of the paving brick industry. During the three-days' meeting of the National Paving Brick Association, Jan. 12-14 at Cincinnati, Ohio, all but three of the discussions centered on test results and on tests in progress or to be undertaken. It was clear that as a result of this research activity a more confident practice is emerging; knowledge is more certain than ever before of the brick itself and of the materials with which it is combined to form a road surfacing. A design practice is being worked out that unifies the brick, the joint filler, the bedding course and the base into an integral structure.

Association research

During the year the Association Research Bureau continued its observation of the action of joint fillers in the Ohio test road; carried out a series of tests on the bonding for a trial road of reinforced brick and made a study of the application of separating agents. As reported by H. Z. Schofield, director of the bureau, observation after two years of the fillers on the Ohio test road led to no change in the four fillers (*ENR* Jan. 13, 1938) that gave satisfactory results during the first year. The two blended asphalt fillers continue in excellent condition. The plasticized sulphur filler shows some evidence of slight bond failure but is otherwise in good condition. So also is the pitch filler except for some evidence of slight blending during the past summer.

The bureau's experiments on bonding and with reinforced-brick paving will have separate consideration in future issues. Its study of separating agents has turned toward foams and gels. The separating agent is used to wash or wet the surface of the laid brick so that when it is flooded with the hot asphalt joint filler that part not absorbed by the joints can be peeled off easily. With the present liquid separating agents application to the surface is difficult without some seepage into the joints in which case the joint bond is broken and the filler pulls out when the surface is cleaned. None of the present process of application (squeegeeing, spraying, or painting) eliminates the seepage hazard and so search is being made for a less liquid compound such as foams or gels.

Bedding course study

R. R. Litehiser, chief engineer of tests of the Ohio department of highways, summed up recent years observations on bedding courses and grout fillers in a series of lantern slides showing surfacing cracks over construction and expansion joints in concrete bases. The bedding courses observed included asphalt mastic, powdered asphalt, natural asphaltic limestone, sand-clay, sand, limestone screenings, slag screenings and granulated slag.

Examination of crack failures on bedding courses of asphaltic types disclosed that the cushion material under the crack had deteriorated by leaching out of the asphalt. It was brown instead of black. Laboratory tests on the brown material showed a decided loss of asphalt compared with the dark bedding material sampled a little distance away from the crack. It also showed a higher moisture content. As the cracks were over expansion or contraction joints in the concrete base it was indicated that moisture entering the joints had injured the asphalt bond in the bedding course so that the material had shifted allowing the course of brick above to settle and a crack to be formed.

As a result of these observations concrete base design has been changed by the Ohio highway department. Now the concrete base is reinforced and is built with expansion joints 120 ft. apart or with no joints at all except construction joints at the end of a day's run of base.

Summarizing Ohio experience with the various bedding courses on bituminous filled brick pavement about one year old Mr. Litehiser lists them in order of preference as follows: (1) Natural asphaltic limestone and granulated slag; (2) mastic and powdered asphalt, and (3) sand and sand-clay. On grout-filled brick pavement the order is: (1) Cement-sand and (2) mastic, powdered asphalt and granulated slag.

Lincoln tunnel tests

Analyzing the reasons for adopting deaired brick for paving the roadway of the Lincoln tunnel in New York city, E. Warren Bowden, assistant to the chief engineer, Port of New York Authority, outlined comparative tests of deaired brick and granite paving blocks that have unique interest. Granite was chosen as a standard of comparison, because of its undisputed wearing qualities.

The first test was the standard Dorry test for surface hardness. Both end surfaces of small cylinders of brick and granite paving block were subjected to the abrasion of quartz sand on a rotating disk. By this test brick gave a coefficient of 19.09 as against 13.8 for granite, showing deaired brick to be 10 per cent harder than granite paving block. A modification of the same test designed to simulate more accurately the actual service conditions of wear showed about 6 per cent less wear on the brick than on the granite.

Tested for abrasion by the standard Deval test the brick showed a French coefficient of wear of 12.1 as compared with 13.5 for granite. A test

for toughness on the standard Page machine gave a coefficient of 19 for brick and of 11 for granite. The Page test consists of dropping a 2 kg. hammer in free fall onto a cylindrical specimen until it is fractured; it proved the brick to be considerably tougher than granite. In transverse strength the brick averaged 2,200 lb. per sq.in. as against 2,700 lb. per sq.in. for granite block. The crushing strength was 23,100 lb. per sq.in. for brick and 24,200 lb. per sq.in. for granite.

The conclusion from these tests was that "vitrified paving brick, manufactured by the deairing process, can be produced equal in strength and durability to the commercial, heavy-traffic grade granite block." Based on this conclusion specifications were drawn calling for a rattler test loss of not more than 22 per cent and in addition for a transverse test and a toughness test besides the usual visual inspection. For the transverse test (ASTM standard) it was required that the average should not be less than 2,000 lb. per sq.in. and that the least value for any brick of a test lot should be 1,800 lb. per sq.in.

The toughness test was a modification of Page test. The brick to be tested is placed flat on knife edges or rollers spaced 7 in. apart. Over the center of the brick is suspended a 2½-lb. steel ball which is allowed to drop freely onto the brick from successive heights starting at 1 ft. and increasing by intervals of 1 ft. until the brick is fractured. It was specified that of ten bricks in a test lot the average toughness value (height of drop) should be not less than 4½, no specimen should have a value less than 3 and only one specimen should have a value as low as 3.

Chipping and breaking

F. H. Jackson, Senior Testing Engineer, Bureau of Public Roads, in a brief paper on research ahead called attention to undesirable amounts of brick chipping and spalling and of brick breakage disclosed by a recent survey of brick pavements. It is now planned by the bureau in cooperation with the NPBA and the Ohio highway department to undertake a series of tests directed toward finding the cause.

In regard to brick breakage in rolling J. A. Williamson, General Superintendent of Construction, W. J. Fitzgerald Co., contractors for the Lincoln tunnel paving called attention to the method there used of rolling on boards. This reduced the rolling breakage to nearly nothing and permitted the use of heavier rollers. The boards were used over and over, the breakage loss being about 10 per cent.

Reconstruction with brick in Baltimore, Md., was described in a paper by F. K. Duncan, Assistant Chief Engineer, Department of Public Works. Some details of this work will be published at a future time. Two papers on brick paving in relief programs by R. F. Koch, City Engineer of East St. Louis, Ill., and A. G. Walter, City Engineer, Dunkirk, N. Y., will also be considered at another time.

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Waterworks Operating Notes

AN INTERCHANGE of notes and comment on operation of waterworks systems that recently took place at a round table discussion in Sacramento (California Section American Water Works Association) brought out useful ideas on current problems.

Ventilation under roofs — Adequate ventilation is a necessity to preventing decay of wooden supports for roofs over water tanks. One of the duties of those in charge of waterworks operation is to see that vents which are provided to maintain such ventilation do not become obstructed or closed. An instance was cited in which a wooden roof near ground level on a depressed tank had adequate, screened ventilators when constructed. Later cheesecloth was placed over the screens to prevent gnats from using the tank as a breeding place and shrubbery used in landscaping grew up close to the openings. This curtailment of ventilation so seriously affected the air conditions under the roof that the structure rotted out in a period of only four years.

Long life of thin steel pipe—In 1870 some 40 miles of 30-in. riveted steel water pipe was laid to serve the city of San Francisco. The metal in most of this line was about ¼ in. in thickness and pipes were carefully treated in a coal-tar dip prescribed by Herman Schussler, who was then chief engineer of the Spring Valley Water Co. (now San Francisco Water Department). About 20 miles of this old line is still in service, most of it having been in continuous service for the 67-yr. period. Replacement of those parts of the original lines that have been changed has come about by reason of street changes or other conditions having nothing to do with the condition of the pipe itself. In fact, the remaining portion of the old pipe, so far as is known, are still in serviceable condition and will not be renewed until street changes or other conditions require replacement.

Dezincification — Dezincification is most likely to occur in light colored brass. Dark colored brasses containing a high copper content are less subject to this trouble.

Milky water troubles—Milky water in the distribution system has troubled many operators and there are numerous ideas as how to cure it. Fundamentals were illustrated by comparing the phenomenon to a bottle of ginger ale in which contents remain clear while under pressure. When the bottle is opened and the liquid is in atmospheric pressure the gas no longer remains in solution and innumerable bubbles at once appear. In quite the same way air is invisible in water under pressure but immediately on reaching atmospheric pressure small bubbles appear. The solubility of gas in liquid is a product of pressure and temperature which is the theory in the use of air-release valves or tanks for areation.

There are two kinds of milky water causes. In one case air gets into the water in such a way that it remains there while the water is under pressure. The other cause is the sort that brings air into the water by the manner in which the stream leaves the faucet. Submerging the tap in an overflowing bottle will prove whether there was gas in the water system or whether it was drawn in from the atmosphere as the water left the tap.

A cure for milky water was effected in one case by tightening the stuffing box on a centrifugal pump; this stopped air suction that caused the milkiness. In general, the most effective remedies are aeration or air-release valves in the line just beyond a pumping station where air is compressed and forced into the system.

THE WEEK'S EVENTS

(Continued from page 97)

Harbor Contract Let By Peru

The Peruvian government has awarded contract for construction of a new harbor at Matarani in Southern Peru and for improvement of the existing harbor works at Callao to the Frederick Snare Corporation of New York City. The two contracts involve an expenditure of about $5,500,000.

The new harbor at Matarani, to cost about $4,000,000, will replace Mollendo, 15 miles to the south, as the Pacific terminus of the Southern Ry. of Peru. Two breakwaters, 2,000 and 500 ft. long, respectively, will shelter an inner harbor in which a new 1,500-ft. wharf will be built. Four warehouses will be constructed on the wharf and about 2,450,000 cu.yd. of rock will be excavated along the shore for fill for the breakwater and wharf.

At Callao, $1,500,000 will be spent on a new 1,500-ft. bulkhead to connect existing docks. The area behind the bulkhead will be filled in, reclaiming about 207,000 sq.yd. of land along the water front which will be utilized for new streets and buildings.

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Civic Center Planned In Montreal

Plans for a $5,000,000 civic center to be built over an area excavated for a proposed Canadian National Ry. terminal have been announced by the Mayor of Montreal. It is planned to finance the project by a grant of $3,000,000 from the federal government as an unemployment relief project and to obtain the remaining $2,000,000 by a bond issue to be repaid from rentals of auditoriums and halls in the structure. The center would be operated for 40 years by a private syndicate and then revert to the city.

The project would include an auditorium with a seating capacity of 14,000, a music hall seating 2,400, and a little theatre for 700, as well as restaurants and similar facilities and a civic section with offices for various city services and a police training school. Office space would also be included.

The C.N.R. will provide the land at a rental of a dollar a year. The railway began construction of a large terminal at the site in 1929; the work was abandoned in 1932 with excavation nearly completed but little construction carried out. Development of the site as a civic center will not interfere with railway operation, since the tracks are underground, but will only prevent construction of the terminal building.

NEW AND RETIRING ASSISTANT CHIEF

COL. JOHN J. KINGMAN (*below*) took office the first of the year as assistant chief of engineers (*ENR* Dec. 30, 1937, p. 1040) succeeding Brig. Gen. George B. Pillsbury (*above*) who *retired from* the army Dec. 31. General Pillsbury's application for retirement was approved by the President Nov. 2. (*ENR* Nov. 11, 1937, p. 7).

Tunnel Approach Road Contract Let

Excavation for a depressed highway connection with the Lincoln Tunnel in Union City, N. J., will be performed by George M. Brewster & Son, Inc., of Bogota, N. J., under a contract awarded by the Port of New York Authority on a low bid of $1,341,000. The contract also includes construction of five rigid-frame reinforced concrete bridges to carry intersecting local surface streets across the depressed highway; it does not, however, include paving or incidental structures on the express highway.

The depressed highway is part of the approach construction which was directed by the legislation which authorized the Lincoln Tunnel. Although existing roads are considered by the Port Authority to be adequate to handle traffic through the present single tube, it is required that the contract be completed by April 1, 1939, in order to handle traffic to the World's Fair, although the second tube will not be ready at that time.

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Engineers Not to Operate Buffalo Plant

The new Buffalo sewer system cannot legally be operated by the consulting engineers, Greeley & Hansen, for the year after its completion, as had been originally planned by the Buffalo Sewer Authority. Corporation Counsel Cornish has held that the authority cannot legally have the system operated by contract.

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Copper Houses Planned At Colorado Hotel

It is planned to build a number of houses and cottages largely of copper during 1938 in connection with the Broadmoor Hotel at Colorado Springs, Colo. Two such houses are planned for immediate construction and a number of others are expected to be built during the year.

The buildings will be of a prefabricated type which, it is stated, can be assembled in 60 hours. Walls will be clapboard covered with copper; roofs will be copper, as will the interior wall surfaces, plumbing, and insulation.

An addition to the main building of the Broadmoor Hotel, also, will be interesting for a wide use of glass. The addition, which will add three stories to an existing one-story building, will have a steel framework, with all partitions and outside walls made of glass brick. The building will be devoted to hotel rooms.

BRIEF NEWS

THE COAST AND GEODETIC SURVEY has stationed a representative in Cleveland to furnish technical advice on the Cleveland regional geodetic and topographic survey, a WPA cooperative project for which the city of Cleveland plans to spend about $200,000 in the extension of horizontal and vertical control.

A ZONING ordinance and building code have been passed by the City Council of East St. Louis, Ill. Enforcement of the new ordinance and code is under the jurisdiction of the city building commissioner. Under the zoning ordinance, the city is divided into nine districts, including one family residential, one- and two-family residential, apartments, commercial, business, light industrial and heavy industrial.

RAPID ELIMINATION of trolley cars and buses from city streets in cases of emergency traffic congestion could be achieved by two-way radio communication with the vehicles if a high frequency wave band were allocated for emergency use for such purposes, it was contended by the American Transit Association and other interested bodies at a hearing held Jan. 6 by the Federal Communications Commission on the proposal to allocate such a wave band.

IF A WIND STORM blows down the White River bridge at Clarendon, the state of Arkansas will suffer no loss. The state recently took out an insurance policy for $947,552, carrying a premium of $426, protecting the steel and concrete portions of the bridge and approaches against damage by wind.

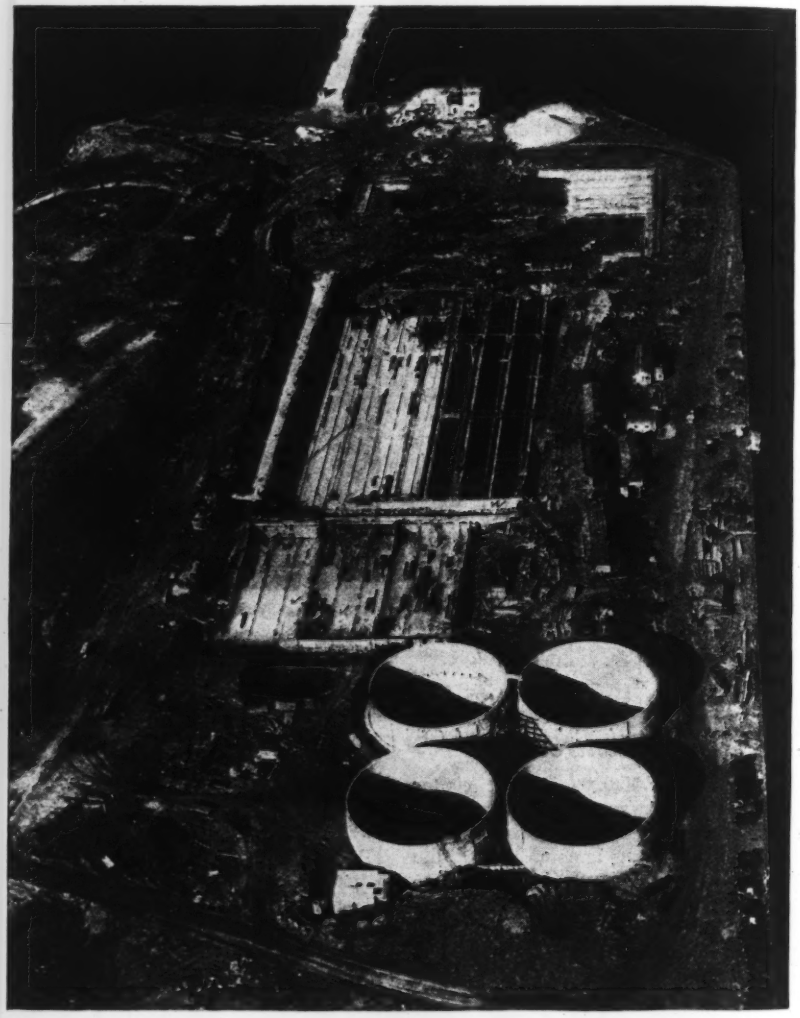
A DECLARATION of intention to raise its existing dam on Independence Lake in California to provide about 4,000 acre-ft. additional storage for the use of its power plants on the Truckee River has been filed with the Federal Power Commission by the Sierra Pacific Power Co. of Nevada. The company proposes to purchase additional land around Independence Lake, to deepen the outlet channel from the lake, and to raise the existing dam at the outlet so as to raise the reservoir surface about 5 ft.

A SPEED LIMIT of 40 miles an hour will be enforced on New Jersey highways during the night hours, it has been announced.

FAILURE to act on an application for a building permit is expensive in Argentina. An Argentine court last month ordered the city of Buenos Aires to pay damages of about $450 per month, from Aug. 16, 1935 until such time as the application is acted upon, for failure to either grant or deny the permit.

CONTRACT for construction of an Ambursen type dam at San Felipe Argentine, has been awarded to Pauling Argentine Ltd. for 2,350,000 paper pesos, about $700,000.

FINAL inspection by railroad officials brought to a close the $4,632,000 railroad relocation work carried on in connection with the Muskingum conservation project, when the Baltimore & Ohio relocation, amounting to about 17 miles, was accepted.



MORE TREATMENT FOR NEW YORK CITY SEWAGE

TALLMANS ISLAND sewage disposal plant, 40-m.g.d. activated sludge unit, will be completed during 1938. The third project in New York City's contemplated program of 38 major sewage treatment plants, Tallmans Island is designed to handle sewage from a drainage area of 17,000 acres that now empties into Flushing Bay near the site of the 1939 New York World's Fair; it will go into operation before the fair opens and thus clean up surrounding waters.

Four circular tanks in the foreground are for sludge digestion, and the excavation beside them will be the site of a grit chamber and a pump and blower house. Farther in the distance are the rectangular primary settling tanks, the long rectangular aeration tank and excavations for the final settling tanks.

Estimated to cost $4,100,000, the project is being built by the New York City Department of Sanitation. The bulkheads, pier and outfall sewer have been completed by J. Rich Steers, contractor. The Northeastern Construction Co. holds the contract for the plant structure for installation of equipment.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

AMERICAN ROAD BUILDERS ASSOCIATION, road show and convention, Cleveland, Jan. 17-21.

AMERICAN WOOD PRESERVERS ASSOCIATION, annual convention, Congress Hotel, Chicago, Jan. 18-20.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, New York City, Jan. 19-21.

NATIONAL RIVERS AND HARBORS CONGRESS, 33rd convention, Mayflower Hotel, Washington, D. C., Jan. 20-21.

PURDUE ROAD SCHOOL, annual school and road show, Purdue University, Lafayette, Ind., Jan. 24–28.

ENGINEERING INSTITUTE OF CANADA, annual meeting, London, Ont., Jan. 31-Feb. 1.

LIME PUTTY PRODUCTS ASSOCIATION, annual meeting, Netherland Plaza Hotel, Cincinnati, Feb. 1.

AMERICAN CONCRETE CONTRACTORS ASSOCIATION, National Concrete Masonry Association, National Cinder Concrete Products Association, Cast Stone Institute, joint convention, Hotel Sherman and Medinah Athletic Club, Chicago, Feb. 7-11.

ASSOCIATED GENERAL CONTRACTORS OF AMERICA, annual convention, Willard Hotel, Washington, Feb. 8-10.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Engineering Societies Building, New York City, Feb. 14-18.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, annual meeting, Engineering Societies Building, New York City, Feb. 14-17.

ASSOCIATION OF HIGHWAY OFFICIALS OF NORTH ATLANTIC STATES, annual convention, Hotel Ambassador, Atlantic City, N. J., Feb. 16–18.

AMERICAN TOLL BRIDGE ASSOCIATION, annual convention, Hotel Chamberlin, Old Point Comfort, Va., Feb. 22-24.

REGIONAL AND LOCAL

NEW YORK STATE SEWAGE WORKS ASSOCIATION, annual meeting, New York City, Jan. 20-22.

NORTH CAROLINA SOCIETY OF ENGINEERS, annual meeting, Raleigh, Jan. 28-29.

ASSOCIATION OF ONTARIO LAND SURVEYORS, annual convention, Royal York Hotel, Toronto, Ont., Feb. 15-16.

SOUTHWEST ROAD SHOW AND SCHOOL, annual session, Wichita Exhibition Building, Wichita, Kan., Feb. 22-25.

NEW JERSEY SEWAGE WORKS ASSOCIATION, annual meeting, Stacy Trent Hotel, Trenton, N. J., Mar. 10-11.

SECTION MEETINGS, American Water Works Association:
New York, Jamestown, Mar. 17-18.
Canadian, Windsor, Ont., Mar. 23-25.

ELECTIONS AND ACTIVITIES

EIGHT MEMBERS of the Seattle section of the American Society of Civil Engineers have been awarded life memberships in the society. They are: Joseph Jacobs, Reginald T. Thomson, Samuel H. Hedges, Ernest B. Hussey, John L. Hall, James B. C. Lockwood, Daniel W. McMorris, and Peter M. Morgenson.

BRIAN PERRY, Montreal consulting engineer, was elected chairman of the Montreal branch of the Engineering Institute of Canada at its annual meeting Jan. 6.

REGISTRATION of all branches of the engineering profession was endorsed in a resolution adopted at the annual meeting early this month of the Louisiana Engineering Society. Only civil engineers are now required to register in Louisiana. The history of New Orleans' drainage, water supply, and flood protection system was outlined by J. Frank Coleman and the delegates were afterwards guests of the New Orleans Sewer and Water Board at a luncheon served at the water purification plant.. Dwight N. Weatherell of Chicago described the construction of the Golden Gate bridge. The 1939 annual meeting, it was decided, will be held Feb. 23-25. B. H. Grehan was elected president of the society; other officers are David W. Godat, first vice-president; Boykin W. Pegues, second vice-president, and Arthur M. Hill, secretary-treasurer.

R. H. CRESSINGHAM is the new president of the Phoenix chapter of the American Association of Engineers. Other new officers are J. Lee Chambers, vice-president; Herman D. Lowry, secretary-treasurer, and V. O. Wallingford, director. Membership in the chapter now totals 279.

M. B. GARRIS has been elected president of the Miami section of the A.S.C.E., and Leroy S. Edwards has been elected secretary-treasurer.

LOUIS V. BENDER was voted an honorary life membership in the Montana Society of Engineers at the December meeting of that body.

Short Course

Rutgers University College of Engineering, short course in "Waterworks and Filter Plant Operation," sponsored by New Jersey section of the American Water Works Association, Jan. 24-Feb. 5, New Brunswick, N. J. Course in "Sewage Disposal and Plant Operation," sponsored by the New Jersey Sewage Works Association, Feb. 14-26.

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License Examinations

NEW YORK: Examinations for professional engineers at New York, Albany, Syracuse and Buffalo, Feb. 1-3. Examinations for land surveying will be held on Feb. 4.

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Doctorates Established For Physics Study

Five post-doctorate fellowships for research in modern physics at the Westinghouse Research Laboratories in East Pittsburgh are to be awarded this spring. The Westinghouse Electric & Mfg. Co. will receive applications until March 1 from men of academic training equivalent to the doctor's degree in physics, chemical physics or physical metallurgy. Candidates are expected to propose a definite research problem within the field of the laboratory's activities. It is not necessary, according to the announcement, that the proposed research have immediate technological value. The facilities of the laboratory, it is stated, are well adapted to study in the fields of nuclear physics, electric conduction in gases, ferromagnetism, dielectrics, thermionics, elastic and plastic properties of metals, and crystal structure.

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Submerged Weir Finished At Niagara Falls

A new submerged weir constructed by the Canadian Niagara Power Co. Ltd. above the Horseshoe Falls, Niagara Falls, N. Y., was formally placed in operation Dec. 28. The weir, which extends 300 ft. into the upper river, was designed to raise the head of water in the power company's forebay and also to distribute more evenly the flow of the river, thus preserving the beauty of the Horseshoe cataract. The structure will restore the level of water in the river at this point to that which existed in 1905; continued low water in the Great Lakes and diversion of water by upstream power plants have reduced the level and made the weir necessary.

PERSONAL

WILLIS J. SMITH has been appointed acting district engineer for the Iowa Highway Commission at Ottumwa, succeeding J. S. Morrison, deceased.

WALTER SMITH has been appointed city engineer of Wheeling, W. Va., succeeding Harry Conrad, who died last month. Mr. Smith has been connected with the Wheeling engineering firm of C. C. Smith Sons.

RALPH G. TAYLOR has been appointed director of public service and safety of Warren, Ohio. From 1921 to 1933 Mr. Taylor was county engineer of Trumbull County and state highway resident engineer there. Since 1933 he has been with the FERA, CWA, WPA, and Mahoning Valley Sanitary District.

ROBERT BABCOCK of the Portsmouth, Ohio, engineer's office has resigned to become assistant superintendent of a National Youth Administration camp at New Philadelphia which will do work on the Muskingum reclamation program in that neighborhood.

GEORGE DEMPSTER, city manager of Knoxville, Tenn., has announced that he will become engineer-manager of the Tennessee Road Builders Association. He retired from public office in Knoxville on Dec. 31.

ARTHUR H. PETTIGREW, senior assistant engineer of the Virginia state highway department, has been appointed right-of-way engineer, succeeding the late Francis D. Henley.

W. W. MCCLEVY, chief engineer of the Bristol district of the Virginia highway department, will succeed Mr. Pettigrew as senior assistant engineer.

C. B. LEECH, JR., engineer for the Virginia highway department in the Lynchburg district, will succeed Mr. McClevy in the Bristol district.

K. K. MCWANE, resident engineer at Halifax for the Virginia highway department, succeeds Mr. Leech as engineer of the Lynchburg district.

L. B. WARD, inspector at Hampton for the Virginia highway department, will succeed Mr. McWane as resident engineer at Halifax.

COMDR. HENRY F. BRUNS, Civil Engineer Corps, U. S. Navy, has been detached from his duties in the Bureau of Yards and Docks and named as public works officer for the Pearl Harbor Navy Yard and the 14th Naval District.

LT. COMDR. HUGO C. FISCHER, who has been serving with the Navy Civil Engineer Corps at the Naval Air Station at Lakehurst, N. J., has been assigned to duty in the Bureau of Yards and Docks at Washington.

LT. COMDR. ROBERT E. HANCOCK, navy Civil Engineer Corps, has been appointed public works officer at the Naval Air Station at Lakehurst. He was formerly at the Navy Yard in Boston.

DANIEL G. O'SHEA, associate engineer for the Bureau of Reclamation at Denver, resigned recently to join the engineering department of the Washington state highway department.

COMDR. LEWIS B. COMBS of the navy Civil Engineer Corps will become assistant to the chief of the Bureau of Yards and Docks on Jan. 28.

GEORGE HACKETT has been named city engineer of Fulton, N. Y., succeeding Harry S. Andrews, who has held the position for the past ten years.

NELSON F. PITTS has been recalled to active duty as city engineer of Syracuse, N. Y. William W. Cronin, who has been in charge, remains as first deputy engineer. The appointment is for a four year term.

JOHN A. GILES is the new city engineer of Binghamton, N. Y. Mr. Giles served as city engineer there from 1908 until 1916 and as commissioner of public works for three years thereafter.

ALBION N. VAN VLECK, of the firm of Hurlbut & Van Vleck, has been appointed first deputy commissioner of housing and buildings of New York City.

EDGAR T. BROWN has been appointed superintendent of the Fayetteville, Ark., municipal water plant. Mr. Brown, who holds engineering degrees from Arkansas and Cornell universities, was for nine years an engineer with the Arkansas Power & Light Co. For the past three years he has been supervising and construction engineer with the PWA.

CAPT. GREER A. DUNCAN of the navy Civil Engineer Corps has been transferred from his position as assistant to the chief of the Bureau of Yards and Docks to that of public works officer in the Mare Island navy yard.

LIEUT. COMNDR. EDMUND B. KEATING, Civil Engineer Corps, U. S. Navy, will leave his position at the Portsmouth, N. H., navy yard and go to the Mare Island yard in California.

A. N. JOHNSON, dean of the college of engineering at the University of Maryland, has retired under the operations of the new state retirement law.

OBITUARY

JOHN H. FISSE died Dec. 29 in Vinita, Okla. Mr. Fisse, 58, was a civil engineer in the employ of the Mississippi Glass Co.

BERT C. GOWEN, 82, for 28 years city engineer of Wausau, Wis., died there recently.

ROBERT C. REAMER, Seattle architect who, before beginning his practice there 18 years ago, was architect for the New York, New Haven & Hartford R.R. Co., died in Seattle Jan. 7 at the age of 65. His buildings included the Seattle Times Building, the Skinner Building, the Great Northern Building, and the Edmond Meany Hotel.

ORA W. JOHNSON, 52, chief engineer since 1934 for the South Bend, Ind. waterworks, died Jan. 7. He had been connected with the waterworks department for 23 years.

CHARLES H. SHERMAN, said to have been the last surviving engineer of the staff which supervised the construction of the Union Pacific transcontinental line, died Jan. 7 in Fayetteville, Ark. at the age of 96.

BURR A. CHURCH, formerly New England manager of the G. & C. Cooper Engineering Co. and at one time connected with the Ambursen Construction Co. of Boston, died at Newton Center, Mass. Jan. 5 at the age of 63.

VICTOR TOPPING, civil engineer and more recently lawyer of Toronto, died Dec. 27 at the age of 42. Mr. Topping received his technical education at the University of Toronto and, after completing war service, served as a resident engineer for the Toronto Harbor Commission.

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Few Jobs in Washington

Prompted by reports of a marked increase in the number of engineers, many from out of town, seeking employment in Washington, the District of Columbia Council of Engineering and Architectural Societies has issued a general warning to the profession that the government is reducing, rather than adding to, its technical personnel. Emergency agencies, notably the PWA, have laid off many employees in the past few months and are continuing to do so. Governmental agencies in the regular establishment are hard pressed by the current drive for economy and, even if funds were available, are prohibited from employing engineers except through the usual civil service procedure.